Multi-County Goods Movement Action Plan

Technical Memorandum 3:
Existing Conditions and Constraints

Prepared for:

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California Department of Transportation
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E.1 MULTI-COUNTY GOODS MOVEMENT ACTION PLAN

This Technical Memorandum (Tech Memo) documents the existing conditions and constraints in the goods movement system within the Multi-County Goods Movement Action Plan (MCGMAP) study area (counties of Los Angeles, Orange, Riverside, San Bernardino, and Ventura). (See Figure E-1 on page E-2.) It also sets the stage for the analysis of future conditions, followed by strategies for improving the movement of goods as well as mitigation strategies to reduce the environmental, health, and community impacts of goods movement.

The MCGMAP is a multi-agency effort led by the Los Angeles County Metropolitan Transportation Authority (Metro), and includes the Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC), San Bernardino Associated Governments (SANBAG), Ventura County Transportation Commission (VCTC), Southern California Association of Governments (SCAG), and the California Department of Transportation (Caltrans).

The goods movement system is vital to the local economy and provides many jobs in the study area. Southern California has become an important trade gateway for the rest of the nation. However, the increasing volume of goods movement in and through the area is straining the existing infrastructure, and is compromising the quality of life, health and safety of the residents and communities in the study area.

The MCGMAP is a strategic opportunity for improving the competitiveness of the goods movement system while minimizing adverse impacts on air quality and public health. While there are numerous interrelated economic and environmental forces driving the need for the MCGMAP, they can be narrowed down to:

- Globalization of trade, particularly the rise of China as a leading manufacturing center
- Changes in logistics management
- Employment and upward mobility
- Transportation capacity limitations, productivity, reliability, and labor availability
- Growing public concerns over the health and air quality impacts of goods movement
- Funding shortages.

All of these factors are being considered as a backdrop to the development of the MCGMAP. The following is a summary of the key findings of this review of the existing conditions and constraints related to the study area's goods movement system.

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Figure E-1
MCGMAP STUDY AREA
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E.2 EXISTING CONDITIONS

A national policy that promotes reduced barriers to trade, combined with the export of U.S. industrial jobs, particularly to Asia, has increased the nation's reliance on imports. As a result, U.S. manufacturing employment in 2004 reached its lowest level since 1950 14.3 million jobs dropping 3 million from 2000. The U.S. trade deficit in manufactured goods rose by $164 billion from 2000 to 2004.[1] The study area bears the impacts of a trade policy that has rapidly increased the flow of goods through its system. The MCGMAP study area also represents the third largest manufacturing center in the nation.[2] Its strategic location makes the study area the nation's largest goods movement gateway, carrying a disproportionate share of international trade.

The study area's San Pedro Bay Ports of Long Beach and Los Angeles are the largest container ports nationally, and the fifth largest in the world. They handled 14.2 million Twenty-Foot Equivalent Units (TEUs) of containers in 2005, a full one-third of all US waterborne container traffic, and 6 times as much as the Bay Area ports. Three quarters of the trade through the ports is produced or consumed elsewhere.[3] Only one quarter is for local consumption. Nearly $200 billion in trade passing through the ports in 2000 supported a national total of two million jobs, which generated over $61 billion in income.[4]

The Ports of Los Angeles and Long Beach handle a broad variety of bulk and containerized cargo. Goods arrive at the ports and are transferred to rail, or highways for movement to final customers. About 40,000 TEUs units move every day through the port.

The study area is home to the nation's busiest rail intermodal operations. The Burlington Northern Santa Fe Railway (BNSF) has three terminals in the area, located in Los Angeles, City of Commerce and San Bernardino. The Hobart (Los Angeles) terminal handles over 1.3 million units annually with one of the highest throughput densities at 5,500 units per acre annually. The Union Pacific Railroad (UP) operates four terminals: City of Industry (255,000 lifts per year capacity), City of Commerce (500,000 lifts per year capacity), the Intermodal Container Transfer Facility (ICTF) near the ports (capacity of 800,000 lifts per year), and the Los Angeles Transportation Center (LATC) in Los Angeles (250,000 lifts per year capacity). The total domestic and intermodal volume moving through terminals in the study area approaches 5 million containers annually, 64 percent of which are international and 36 percent are domestic containers[5].

Southern California is served by two Class 1 railroads, the BNSF and the UP. On an average weekday, 80 freight trains run through the study area, hauling 52 percent[6] of the ports' international containerized goods to and from other parts of the country. This rail network also carries traditional rail carload traffic and finished import automobiles moving in multilevel railroad autorack cars. In addition to the freight trains, the network carriers 145 commuter trains on average each weekday.

Passenger trains, both Amtrak (intercity passenger rail) and commuter (transit rail) operations also share the freight rail network. The 2001 California State Rail Plan projects growth in passenger use of 2.5-3 fold increase in passenger use by 2011. Metrolink trains operate on time 95% of the time on Metrolink controlled trackage. On tracks owned by the BNSF and UP, Metrolink trains only operate on time 70-85% of the time. In 2001 when passenger trains were late, delays were attributed to BNSF freight trains 37% of the time and to UP 25% of the time. Delays created by Metrolink trains only accounted for 4% of the delays, delays caused by Amtrak were only reported as the cause for 2% of the delays. Freight interface causes significant operating problems for Metrolink, especially on the UP's Los Angeles subdivision between Riverside and Los Angeles. "Heavy UP port rail traffic results in Metrolink trains operating late almost on a daily basis. Heavy BNSF port rail traffic on their San Bernardino Subdivision between Los Angeles and San Bernardino also causes delays for Metrolink trains"[7]

The study area's highways are the most congested in the nation and carry some of the highest truck volumes.[8] This area has six of the most congested truck routes in the nation.[9] One third of the region's 9,000 lane miles of highways carry more than 10,000 trucks per day. I-710, which links trucks directly to and from the ports, and I-605 and SR 91, carry up to 40,000 trucks on an average weekday.[10]

The second largest air cargo hub in the nation is Los Angeles International Airport, handling approximately 75% of the study area's 2.7 million tons of air cargo in 2003.[11]

Warehouse, distribution, transload, or cross-dock operations occupy over 1.5 billion square feet of building space throughout the study area, representing 15 percent of the national market, and 60 percent of the entire west coast. Another 32 million square feet of building space are under construction.[12]

The Alameda Corridor, at a cost of $2.4 billion, is one of the largest public/private goods movement projects in the nation. It has doubled railroad speeds between the ports and downtown Los Angeles and allows nearly 50 trains a day to avoid conflicts at 200 at-grade crossings between downtown Los Angeles and the ports.

While the MCGMAP study area goods movement system is large, its disproportionate role in supporting the growth in international trade creates significant impacts on the local multi-modal goods movement system, communities, and the environment. The following is a discussion of the issues and constraints that impact the area's goods movement system.

E.3 EXISTING ISSUES AND CONSTRAINTS

Community Concerns about Environmental Impacts - Community-based concerns over public health and other environmental impacts present a significant challenge to the future development of the goods movement system. Over time, the focus on types of air quality impacts has changed. For much of the 20th century, concerns were generally about the visual impacts. In recent years, as the visual nature of air pollution (smog) was reduced, concern shifted to the health impacts associated with various pollutants. Research conducted by the Keck School of Medicine at the University of Southern California (USC) indicates that the combination of gases and fine particles in transportation exhaust, especially diesel fuels, affects lung function and contributes to arterial thickening, birth defects, and low birth weights.[13] Data also indicate that the closer one lives to pollution sources, such as the ports, intermodal yards, or major freeways, the higher the risk. As examples, the increased incidences of cancer and of asthma in children are shown to be related by proximity to pollution sources. Furthermore, the study area is required to demonstrate attainment with National Ambient Air Quality Standards (NAAQS) established per federal mandate. The U.S. EPA routinely evaluates air quality nationwide and periodically updates or establishes new standards (NAAQS). For example, on April 15, 2004, EPA implemented an 8-hour ozone NAAQS (supplanting a previous 1-hour ozone standard), for which the South Coast Air Basin is to demonstrate attainment by 2021. These obligations cannot be achieved without significant investments in environmental mitigation as well as more focused efforts at reducing the level of emissions from goods movement activities, as well as from other sources.

The widespread dissemination of this information has raised awareness of these issues and increased concern within affected neighborhoods. Environmental groups have forced a significant slowdown in port development in recent years. An example is the proposed Pier J expansion at the Port of Long Beach that was halted due to concerns with the environmental document. Improvements to the China Shipping Terminal at the Port of Los Angeles were delayed because of a lawsuit by the Natural Resources Defense Council (NRDC). Community-based resistance has also affected plans to address the existing levels of highway congestion.

After nine months of deliberations by a broad-based group appointed by I-710 corridor communities and the I-710 Oversight Policy Committee (OPC) (collectively known as the Tier 2 Committee), a consensus emerged.[14] This consensus also involved community-level committees (known as Tier 1 Committees) consisting of the most directly impacted communities in the corridor. The chairs of the Tier 1 Committees were also represented on the Tier 2 Committee, along with a representative named by each City Council in the remaining corridor cities.[15] The committee recognized that something must be done to address the current congestion and design of the I-710 freeway, and that the hybrid design concept presented could accomplish maximum build-out in a manner that reflected the Tier 1 Committee's concerns and recommendations for their communities.[16]

The experience and results of the I-710/Major Corridor Study show that consensus can be achieved when the community is involved at the local level. The consensus achieved on the I-710 hybrid alternative is a major success story and is proof that responsible agencies and communities can resolve differences and find a common agenda to move forward. The efforts of the I-710 / Major Corridor Study were led by Metro and the Gateway Cities Council of Governments. The MCGMAP will require similar success stories. Nevertheless, concerns over the negative health impacts of diesel emissions potentially threaten the viability of the I-710 improvements and other goods movement projects, including plans to expand rail intermodal capacity, airport capacity, and the development of warehouse and distribution facilities.

Port and Airport Facility Efficiency, Capacity, and Throughput - In addition to community-related concerns, there are also physical and operational constraints affecting existing capacity and throughput at the ports and airports in the study area. The potential throughput at the port terminals is constrained by existing operational and management practices. While the estimated maximum throughput capacity at the San Pedro Bay ports is over 10,000 TEUs of containerized cargo per acre per year,[17] current average throughput at both ports combined is about 4,700 TEUs per acre per year.[18] Terminal capacity is affected by the availability of berths, backland acreage, and the number of cranes, as well as operational and management practices related to container stacking and storage, container dwell times, hours of service, and labor productivity. Capacity has been recently enhanced by the use of information technology such as optical character recognition systems and Radio Frequency Identification (RFID).

PierPASS was introduced in July 2005 to help shift traffic from the traditional work day hours to off peak travel times. These off peak travel times are defined as 6:00 pm – 3:00 am Monday through Thursday, and 8:00 am – 6:00 pm on Saturdays. This program provides an incentive to importers to move containers during off peak times. In the past year the PierPASS official website estimates that on average 60,000 truck trips per week have been shifted to off peak hours, or roughly 30-35% of the port cargo now moves off peak. The PierPASS official website estimates that next year as many as 2.8-3 million truck trips may be shifted to off peak travel times.

While container traffic has received most of the attention in recent years, the terminal capacity for commodities such as petroleum liquid bulk is a growing concern at the ports. California is now an important net importer of refined fuels, and demand is outstripping petroleum storage capacity. The need to accommodate containerized cargo is crowding out the petroleum facilities, adding to the overall complexity surrounding the expansion of the terminals.

Competition for space also impacts the airports in the study area, particularly Los Angeles International Airport (LAX), where high demand exists for both passenger and cargo services. Needed for air cargo services are runways, taxiways, aprons to park aircraft, maintenance facilities, and cargo-handling facilities. One proposal to alleviate this competition at LAX is to attract cargo to outlying airports such as San Bernardino International, Ontario International, Palmdale, Victorville and March, where capacity exists. Some of these have been proposed as all-cargo airports. However, the potential for all-cargo airports is limited because a significant portion of air cargo moves in the bellies of large international passenger aircraft, due to the pricing advantage offered by the extra belly space, most of which fly out of LAX. In addition, since most air cargo is destined for use within the region, the location of LAX makes it the most convenient with respect to the cargo's final destination.

Highway Congestion, Delay, and Maintenance - While congestion and delay affect the everyday lives of commuters in the study area, they also have a significant impact on goods movement. Eighteen percent of all truck volumes on the freeways within the study area experience delay due to congestion, which results in an increase in the cost of transporting goods by 50 to 250 percent.[19] Goods rely substantially on trucking to connect warehouses, distribution facilities, intermodal facilities, and other businesses. For the most part, these facilities and businesses operate during daytime hours, though some operate during the night, too. Daytime operations cause conflicts between everyday commuter traffic and truck traffic. This conflict also creates a perception that goods movement is the sole contributor to congestion and delays. However, the bulk of truck traffic does not occur during the traditional morning and early evening peak commuter hours. Approximately two thirds of truck travel occurs during the off-peak hours. Therefore, the issue of congestion and delays on the highway system cannot be fully addressed without including strategies to reduce the impact of commuter traffic as well as goods movement. In addition, trucks contribute to pavement deterioration. While an 80,000 pound truck weighs as much as 20 automobiles, it has the same impact on pavement condition as 9,600 automobiles.[20] Insofar as trucks pay truck weight fees that contribute toward a portion of growing road maintenance costs, these revenues do not contribute to congestion relief.

Truck Access and Turnaround Times at Goods Movement Facilities - While delay on the roadway system impacts goods movement, the most significant delays are at the goods movement facilities such as ports, intermodal facilities, and warehouse and distribution centers. The issue is most evident at the port container terminals, where almost half (44 percent) of the total roundtrip time is spent waiting for the container to be loaded and unloaded.[21] The delay is not associated with the actual turnaround of the load, which on average takes about 35 minutes, but with the queuing time to be loaded.[22] Regulatory measures, such as AB 2650, a state law passed to impose a fine on terminal operators if trucks idle outside the gate for a period longer than 30 minutes, have been effective in reducing queuing outside terminal gates. [23] However, some truckers complain that the queuing has simply moved inside the terminal gates. Terminals that maintain appointment systems or extend gate hours are able to avoid AB 2650-related fines. With PierPass in effect, all terminals have extended hours and are therefore exempt from these fines.

Mainline Rail Capacity - There are two immediate issues facing the railroads serving Southern California; terminal capacity to load and stage freight and mainline capacity east of Los Angeles over the mountains. As a result of historical growth in the intermodal container market, mostly due to growth in Asian imports, mainlines are reaching their capacity. Terminals are being stretched to their limits, recent reduction in free time at the terminals has provided some relief but the growing volumes are exceeding the capacity of the existing terminals. Some carriers have actively tried to relocate business segments to other terminals east of Los Angeles, with some success. The impact of mainline capacity constraints is a reduction in system velocity, which results in delay and increased backlog along the mainlines as well as at the rail yards. The average train trip is delayed by over 30 minutes east of Los Angeles.[24] A backup in the system is far reaching, resulting in the delay in the delivery of time-sensitive shipments to customers nationwide. In addition, Metrolink commuter passenger rail services, in general, operate on the existing freight rail system.

In addition, Metrolink commuter passenger rail services operate on the existing freight rail system. Metrolink is planning major increases in passenger trains using BNSF and UP mainlines in the study area; these increases will further strain capacity in the absence of any improvements. Metrolink trains are most frequent during the morning and afternoon weekday commute periods, and are oriented inbound to Los Angeles in the morning and outbound in the afternoon. About a third of Metrolink trains operate on BNSF and UP mainlines today. Amtrak long distance and Pacific Surfliner corridor trains also use BNSF and UP mainlines in the study area.

Capacity is also a concern on publicly owned track. As noted, Metrolink dispatches about 100 freight rains on publicly owned track, and these trains share the track with the majority of Metrolink trains. As freight and passenger trains increase, capacity will increasingly become a concern for all users of these publicly owned tracks.

Rail Intermodal Capacity Constraints - Rail intermodal facilities allow for the transfer of containers from one mode to another, specifically the transfer of containers between rail and truck. The location of an intermodal yard, relative to the ports, has an impact on the amount of truck travel through the study area. There are two general types of intermodal terminals. On-dock rail terminals are typically single user facilities which are fed directly by an ocean vessel. While the inbound containers are significant, often time sensitive cargo or containers destined to secondary markets will move to the common user intermodal facilities, off-dock. Off-dock terminals as noted earlier, create blocks of traffic, and the terminal operators build these blocks to match the markets the train will be serving. So all the Chicago freight is grouped together and separated from the Dallas or the Kansas City blocks of traffic. These two types of terminal facilities have some important safety and velocity differences. On-dock terminals have been very successful in reducing truck traffic in the study area. A truck carrying a port-generated container to an intermodal yard in or near a port (i.e., an on-dock or near-dock intermodal yard) will travel a shorter distance than one going to an inland facility (i.e., an off-dock intermodal yard).

The efficiency of an intermodal yard has an impact on the overall productivity and velocity of the goods movement system. On-dock facilities typically are single-user facilities, and near-dock and off-dock facilities are typically common user facilities. Marine terminal on-dock rail yards have a different set of safety concerns than off-dock rail facilities. These safety issues are driven, in part, by the marine terminal workers. Even with this, the on-dock rail yards have made an enormous contribution to reduction of truck traffic on the highways. In 2005, over 1.6 million lifts (21% of the San Pedro Bay ports' volume) were handled at the on-dock rail yards.

Intermodal throughput capacity is also affected by the types of operations and practices utilized by the railroads operating the intermodal yards. For example, the UP uses a "wheeled operation" at its Intermodal Container Transfer Facility (ICTF), where almost every container is stored on a trailer chassis. While this lowers the cost of operations, it also limits the container throughput per acre. In comparison, the BNSF uses management techniques to increase throughput per acre at its Hobart facility, including stacking containers vertically, allocating containers (per carrier), and imposing fees on containers that stay longer than a day. The result is that throughput per acre per year is twice as high at Hobart[25] as it is at ICTF.[26]

Grade-Crossings - The impacts associated with at-grade crossings include noise, congestion, emissions, and safety. While communities and transportation agencies have worked hard to address at-grade crossing issues, in conjunction with efforts to encourage diversion from truck to rail, there is a significant shortfall in funding to fully implement existing plans. The Alameda Corridor project was successful in eliminating conflicts at 200 at-grade crossings between downtown Los Angeles and the ports. The project continues to reduce accidents, emissions, and congestion, as well as improve safety for the traveling public. There are existing efforts to eliminate at-grade crossings east of Los Angeles. However, the amount of federal funding provided accounts for only 23 percent of what was requested. Alameda-Corridor East related projects, including specific grade separations, received approximately $212 million of the estimated $900 million requested as part of the most recent national transportation reauthorization bill. This is arguably a national issue given that the freight traffic on the rail system is headed for destinations throughout the nation. The shortfall in funding for grade separation projects has implications for the safety of the communities along the rail freight corridors.

Metrolink is embarking on a Sealed Corridor initiative. The purpose of the project is to enhance safety at crossings as well as to inhibit unauthorized vehicular access to rail rights-of-way owned by Metrolink. The current focus is on at least 57 crossings in the San Fernando Valley and Ventura

County. This project gained increased attention following an incident within the railroad right-of-way within the San Fernando Valley.

Truck Safety - Truck accidents result in a higher probability of damage to the other vehicle and injury to its occupants. Of all accidents involving large trucks, 84 percent of fatalities are passengers in vehicles other than the truck.[27] In the same study of all large truck collision incidents, 50.7% of these events were caused by the driver of the passenger vehicle. Between 2000 and 2003, the number of fatalities in accidents involving a truck increased by 17 percent in the study area.[28] Moreover, an accident involving a truck impacts system traffic flow more so than an accident involving passenger vehicles. The lack of truck inspection and enforcement facilities within the study area presents a further constraint to addressing truck safety. Caltrans operates 37 truck inspection facilities in California.[29] Six (6) of these facilities are operational within the study area, at the following locations:

- Los Angeles County, Castaic (I-5)
- San Bernardino County, Cajon (I-15)
- Riverside County, Blythe (I-10)
- Riverside County, Desert Hills (I-10)
- Orange County, Peralta (SR-91)
- Ventura County, Conejo (US-101)

These facilities are located near the borders of the study area and inspect trucks entering or exiting the region. There are no inspection facilities within the study area that inspect the intra-regional truck travel.

Automobile drivers and passengers are often concerned about being involved in a traffic accident with a truck. These concerns may affect the implementation of goods movement and trade initiatives in the study area.

Changes in Regional Shipping and Transloading - There are several changes being made in the way goods are transferred from ports to inland locations that impact the goods movement system. These changes are already occurring and affecting the existing system. An example is the growth in the transload business, whereby contents from international containers arriving at international ports are transferred to larger containers at transloading locations across the study area, for distribution throughout the domestic network. This results in an increase in local truck traffic between ports and transloading centers where the consolidators mix international merchandise and reload it into domestic containers for shipment to inland distribution centers. These changes, as they exist today, are driven by market forces to continually reduce costs and improve the efficiency of the goods movement system. Improving the physical goods movement infrastructure system can take years, but market forces can make operational changes in relatively short periods of time.

Shifting of Land Uses and Development Patterns - The locations chosen by private sector developers for land uses associated with goods movement, specifically warehouses and distribution centers, are shifting away from the traditional locations close to the ports and intermodal rail yards. This practice is impacting communities located throughout the study area and, in particular, to the east of Los Angeles. Increased truck travel to reach these more distant locations causes increased emissions and congestion. Moreover, these new warehouse and distribution facilities are appearing in high growth real estate markets where residential and other commercial development demands are growing. The result is a conflict between residential and goods movement uses. Therefore, the same concerns raised by communities around existing goods movement-intensive land uses (increased truck traffic, intrusion on neighborhoods and schools, noise, congestion, emissions, safety) are emerging in new areas.

System-wide Goods Movement Data and Information - Good information and data are required to make effective decisions about the goods movement system and its impacts. Currently, the level of existing data and information is not sufficient to effectively support decisions concerning an ever-changing, market-driven goods movement industry. This Tech Memo identifies two specific areas of concern. The first is the data and information used to support travel demand modeling tools and techniques. The second is a lack of system-wide performance data for the goods movement system. While the carriers and the modal operators typically have data and information regarding the performance of their particular areas, there is no system-wide approach to monitoring and managing the performance of the system as a whole. Shippers and receivers have good data about their specific shipments, including location, volume, type, and other information they need to make decisions about the allocation of their inventory and stock. But they do not track data on the operational aspects of the modal system, its efficiencies, its performance, where the bottlenecks and delays are, what the average speeds are, the velocity of the system, and the allocation of assets (e.g., trucks, chassis, container slots) other than the areas within their respective sphere.

Not having a means for measuring and determining performance across the system undermines the ability to identify opportunities for optimization throughout the system. System-wide measures will likely help to identify opportunities for improving performance. Also, the lack of system-wide performance data undermines the effectiveness of policies and investments directed at specific issues. For example, existing port policies directed at shifting truck traffic to off-peak hours have been effective at reducing congestion on the highway system.[30] However, these policies have had negative impacts for individual truck drivers who spend longer hours away from their families,[31] as well as for communities near warehouses and distribution centers that now have to deal with more noise and traffic at night. Performance measures for all aspects of the goods movement system, including operations and throughput, congestion and delay, air quality and emissions, and others, are needed to improve the effectiveness of the system.

Security - While there are existing federal programs to improve security, seaports and airports must fund many of the security projects using their own resources, which are already limited. Congress is currently evaluating the effectiveness of security procedures and programs for air cargo and maritime cargo. For example, one of the options for air cargo is to implement 100 percent screening, requiring large amounts of land near air cargo facilities, the consolidation of air cargo facilities, additional warehouse screening buildings, separate secure access roads for trucks, increased security personnel, and screening equipment and technology.

Availability of Funding - Funding for goods movement-related projects is falling behind. The most tangible example is the shortfall in funds requested by communities and agencies in the study area in conjunction with the most recent national transportation reauthorization legislation

(SAFETEA-LU). Although its political leaders and transportation agencies jointly supported several key projects for funding, the study area received a minor share of the total amount requested. While there is a growing awareness of the existing capital needs required to accommodate goods movement as well as to mitigate the impact of goods movement, this awareness has not translated into funding. The MCGMAP will address the need for mechanisms that translate the value (created by improvements to the study area's goods movement system) into revenue to be directed to improving infrastructure and meeting mitigation needs.

A Disparate Goods Movement System and Community - Today's goods movement system optimizes each mode within the supply chain. Gaps occur at the points of interface where information and ownership of the goods are exchanged. This fragmentation makes it difficult to tackle the issues in a coordinated and strategic manner. Although the system operates well enough to allow goods to effectively move from mode to mode, the organizations involved in goods movement -- private carriers, intermodal operators, warehouse and logistics operators, port owners and operators, and the public entities and transportation agencies -- function independently. Many of the identified issues and constraints require a system-wide solution. Private sector entities operate in a competitive environment that makes it difficult to create broad-based support for major solutions, since a solution that helps one mode may reduce the competitiveness of another. While individual operators within the system address operational and investment strategies within their respective sphere of influence, they do not have the means nor the information to address system-wide issues. Coordination among the modal components, where it does exist, is to increase their competitive edge. Wal-Mart is the leader in supply chain integration and it has often been said that Wal-Mart is a supply chain company that happens to have retail stores.

Public agencies each have their own specific transportation planning processes and typically have differing priorities and time horizons for decision making and investments. A project viewed as a priority in one jurisdiction may be viewed as competition for finite resources by a neighboring jurisdiction. There are many communities affected by goods movement throughout the study area, and each represents potentially different ideals and priorities. One community's view of economic growth and prosperity may translate to health and congestion concerns in another. The challenge is to develop an institutional approach that can garner the collective support of the private sector to tackle specific solutions that are broad and system-wide. The fragmented nature of the goods movement system will make it more difficult to address some of the major issues identified by this existing conditions Tech Memo.

E.4 CONCLUSION AND NEXT STEPS

The following summarizes the overall findings based on the data and information presented as part of the existing conditions task:

- The MCGMAP study area is a "World Class" goods movement system and is the model for North American distribution and logistics. It consists of an elaborate network of roadways and railroads that connect to a series of ports, intermodal yards, warehouse/distribution centers, businesses and retail centers.

- It creates local economic prosperity and job opportunities at the same time that it supports the national and global economies. The goods movement system impacts the health and safety of the communities in the study area. These impacts potentially undermine the future viability of the system.

- Community concerns about the impacts of goods movement, including emissions, congestion, health effects, noise pollution and land use conflicts, presents an obstacle for the future development of the goods movement system.

- The study area's ports, airports and rail carriers and intermodal terminals have existing capacity constraints that undermine the efficiency and productivity of the system as a whole. Furthermore, the volume of traffic on the existing roadway and rail networks are reaching capacity. As a result, the system as it exists today is susceptible to disruptions to the movement of goods, causing delays that reduce the quality of service, and increase costs to consumers.

- The existing conditions of the goods movement system present significant safety concerns for the traveling public, specifically safety concerns regarding at-grade crossings and truck accidents. In addition, the increased focus on the security of the system has placed a significant fiscal burden on the owners and operators of the goods movement system, particularly at the ports and airports.

- While the goods movement system is largely intermodal, allowing goods to seamlessly transfer from one mode to the other, the organizations and entities involved in movement of goods are structured to operate independently, often with competing interests. In addition, good information and data about the flow of goods and the performance of the system is not comprehensive and system-wide. These factors lead to missed opportunities for the coordinated funding and deployment of system-wide solutions.

- A lack of funding affects all modes. It presents a significant obstacle to reaching a balanced emphasis on expenditures that improves the competitiveness of the goods movement system and minimizes the impact on the health and well being of the community.

The next step of the MCGMAP effort, evaluating future conditions and forecasts, is currently underway. It is likely that many of the same conclusions drawn from this existing conditions Tech Memo will surface during this step. The findings of the forecasting analysis will be documented and presented to the stakeholders in the MCGMAP study area. Thereafter, strategies to accommodate goods movement and to mitigate their impacts will be evaluated and presented.

1.1 PROJECT OBJECTIVES, STUDY AREA, & ADMINISTRATION

The Multi-County Goods Movement Action Plan (MCGMAP) is a consensus strategy and implementation plan for the goods movement system within the project study area consisting of Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties.

The objectives of the MCGMAP are to:

- Document existing multi-modal freight movement systems and constraints
- Identify projected goods movement growth and trends
- Identify infrastructure improvements and operational strategies to enhance efficiency and the throughput of goods
- Identify strategies to lessen community and environmental impacts of goods movement
- Identify solutions for implementation and needed public-private institutional arrangements

The agencies participating in the development of the MCGMAP are:

- Los Angeles County Metropolitan Transportation Authority (Metro)
- Orange County Transportation Authority (OCTA)
- Riverside County Transportation Commission (RCTC)
- San Bernardino Associated Governments (SANBAG)
- Ventura County Transportation Commission (VCTC)
- California Department of Transportation (Caltrans) Districts 7, 8, 11 & 12
- Southern California Association of Governments (SCAG)

The administrative lead for the project is Metro. The participating members are all part of the Technical Advisory Committee (TAC), which meets approximately monthly. The TAC members also work with a committee consisting of the Executive Officers (TAC Exec Committee) of the participating agencies. A broader Stakeholder Advisory Group (SAG) meets approximately every second month. The MCGMAP also coordinates with existing forums (e.g., the SCAG Goods Movement Task Force) and provides regular updates and input obtained from a broad range of agency and private sector stakeholders.

Figure 1 shows the MCGMAP study area and illustrates the existing system for regional goods movement. Two additional terms are commonly used in this Tech Memo: 1) "Southern California," which is the study area plus San Diego County and Imperial County and 2) "SCAG," specifically in relation to SCAG data, which includes the study area plus Imperial County.

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Figure 1
MCGMAP STUDY AREA
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1.2 BUILDING AN ACTION PLAN: OVERVIEW OF PROJECT TASKS

Tasks for the entire project are summarized below:

Task 1.0 Project Management and Administration - This task consists of the ongoing project management and administration of all tasks, including monthly TAC meetings and weekly correspondence between the consultant project team and Metro project manager.

Task 2.0 Outreach Assistance - This task comprises the stakeholder and private sector outreach elements of the project, including periodic SAG meetings, planned workshops within the study area counties, and stakeholder surveys.

Task 3.0 Compile and Collect Goods Movement Data – This Tech Memo provides a summary of Task 3, focusing on the existing conditions and constraints of the goods movement system.

Task 4.0 Assess Growth in Freight Demand, Trends in the Logistics Industry and Baseline (2030) System Performance – Task 4 focuses on the assessment of future freight growth within and outside of the study area. The goal of Task 4 is to identify the baseline conditions for the study area, as well as identify potential freight growth scenarios that could occur depending on local or global changes to the goods movement industry.

Task 5.0 Evaluate Economic, Environmental and Community Impact of Freight Movement Generators and Facilities – The purpose of Task 5 is to identify the economic, environmental and community impacts of the existing goods movement system described in Task 3. A secondary objective of this task is to identify the framework for evaluation of future economic, environmental and community benefits under future freight growth scenarios or with future goods movement projects.

Task 6.0 Identify and Evaluate Strategies for Improving the Movement of Goods – This task includes the critical element of the MCGMAP project; the evaluation of strategies and projects identified to improve the future movement of goods. These strategies and projects will be developed through coordination with the TAC and evaluated against the freight growth scenarios identified in Task 4. The capital costs and operating of the strategies and projects will be quantified wherever possible, while the costs of environmental and community impacts will be identified in a qualitative manner.

Task 7.0 Identify Strategies for Mitigating the Effect of Goods Movement on Local Communities and the Environment – This task will consist of the identification of strategies and measures to mitigate the environmental and community impacts of the goods movement strategies identified in Task 6.

Task 8.0 Develop Multi-County Goods Movement Action Plan Report and Identify Institutional/Funding Arrangements Needed to Implement the Plan – Task 8 will be the culmination of the project and will include the identification of institutional and funding arrangements necessary to implement the action plan.

The tasks described above are building blocks leading to the ultimate development of the MCGMAP. Each task focuses on one element of the MCGMAP, with the goal of creating a comprehensive action plan.

1.3 ORGANIZATION OF THIS TECH MEMO

This Technical Memorandum (Tech Memo) documents the existing conditions and constraints of the goods movement system within the study area. Collected as part of Task 3 of the MCGMAP, the data provide the foundation for the analysis of future regional goods movement conditions and the development of strategies to facilitate the movement of goods throughout the study area.

The roles of each component of the goods movement system are addressed from a regional perspective. The Tech Memo also documents the existing constraints on the regional goods movement system. Finally, it presents an initial discussion of the existing environmental and economic conditions within the study area. This Tech Memo is not intended to provide a complete description of the environmental, health, and community impacts or the economic benefits of goods movement. These items will be addressed in more detail in subsequent project tasks and reports.

The Tech Memo consists of five major sections:

- **Executive Summary** – An overview of this Tech Memo.
- **Section 1: Introduction** – Introduces the project, defines the study area, and sets the context.
- **Section 2: Existing Conditions** – Reviews the existing conditions of the goods movement system itself. It is organized by modal sector.
- **Section 3: Modal System's Role in the Supply Chain** – This section outlines how the various modes interact within the overall supply chain and discusses the performance of the overall system.
- **Section 4: Constraints, Issues, and Problems** – Provides an overview of the constraints, issues, and problems. It is intended to set the stage for the subsequent analysis in the project, providing insight into the kinds of issues that will be addressed.

1.4 OVERALL CONTEXT

The MCGMAP is being developed within the context of a rapidly evolving economic and social context. While numerous interrelated economic and environmental forces are driving the need for the MCGMAP, they can be narrowed down to:

- Globalization of trade, and off-shoring and outsourcing of manufacturing
- Changes in logistics management trends
- Need to create employment opportunities and upward mobility
- Transportation capacity, productivity, and reliability
- Environmental consciousness and protection
- Fiscal constraints

The rapid outsourcing of U.S. manufacturing to Asia, particularly China, has led to unprecedented growth in Pacific trade, which has resulted in enormous stress on port and transportation infrastructure in the multi-county region. The U.S. trade deficit with China doubled in just three years, between 2001 and 2004. Recognizing the changing economic reality, Governor Schwarzenegger visited Asia in 2005 and saw firsthand the shifting manufacturing landscape and its significance for California. The Governor's trip indicates that the study area's role in goods movement has geopolitical significance and stature. It means that governments and businesses throughout the world have a keen interest in solving goods movement-related issues in the study area.

Just-in-time delivery, regional warehouse development, and transloading have dramatically affected the distribution of goods in Southern California. Logistics managers, in their attempt to reduce transportation and inventory carrying costs, are continuing to look for ways to improve their companies' bottom lines. Government agencies have found it difficult to anticipate and to respond to these changes, but to effectively plan for goods movement facilities, government and industry must do a better job of collaborating.

Another critical issue to the MCGMAP study area is providing jobs, particularly to employees with limited educations. The logistics industry has proven to be a valuable employer, giving many of the region's citizens a chance for upward mobility. If employment related to goods movement activities in Southern California is not resolved, a significant segment of working class people will be directly affected.

Two recent events illustrate the fragility of the supply chain: 1) the west coast port lockout of September and October of 2002, which in just 10 days disrupted over $6 billion in trade through the San Pedro Bay ports, and 2) the San Pedro Bay ports congestion during the fall of 2004, which was caused by an insufficient supply of longshore labor and railroad equipment to handle the volume of cargo during the busy fall peak season. Questions about the reliability of the San Pedro Bay port complex have led some shippers to diversify their cargo routes. However, despite these setbacks, most experts believe that the ports of Los Angeles and Long Beach will continue to be the primary gateway for Asian imports into the United States.

The growth in international cargo has put unprecedented demands on port and port-access infrastructure. The ability to move cargo through port terminals is also being tested by the advent of mega-ships capable of carrying over 8,000 twenty-foot equivalent containers. There are increasing demands to make better use of existing transportation assets, such as terminals and freeways. A good example is the continued effort – through the private PierPASS program established in response to a legislative initiative – to move more cargo at night and on weekends. Another example is the use of technology, such as radio frequency identification (RFID) and optical character recognition systems, to improve productivity at port terminals.

Traffic congestion, land use, and the health impacts of air pollution are probably the biggest concerns facing goods movement stakeholders. Communities rose up in opposition to the original plans for the expansion of I-710 primarily because of the anticipated displacement impacts. In 2005, however, consensus was reached by all I-710 corridor cities, the Gateway Cities Council of Governments, and the Los Angeles County Metropolitan Transportation Authority (Metro) on a hybrid alternative that minimized right-of-way impacts. Still, concerns over the health impacts of diesel emissions threaten the viability of the I-710 improvements and all other goods movement projects. The two ports, California Air Resources Board (CARB), the South Coast Air Quality Management District (SCAQMD), the Southern California Association of Governments (SCAG), the Los Angeles County Metropolitan Transportation Authority (Metro), and other agencies have responded by aggressively seeking reduction in emissions.

These issues are playing out in the context of limited financial resources. The recent federal transportation reauthorization bill provided far fewer dollars to key projects than anticipated. Several bond proposals have surfaced in the last year, including SB 1266 and the Governor's Strategic Growth Plan; however, even with these new resources, additional funding from the private sector through negotiated public-private partnerships will be essential.

All of the issues described above have played a role in motivating goods movement stakeholders to initiate the groundbreaking multi-agency MCGMAP effort. The political leadership within the study area realizes the importance of working together to solve problems and to secure funding for goods movement infrastructure and the mitigation of impacts. The MCGMAP represents collaboration, inclusiveness, and compromise, for only through consensus can true progress be made.

This section presents the existing conditions of the various facilities related to goods movement throughout the study area. Other very important components of the MCGMAP study area's goods movement system are the social, environmental, economic, and air quality impacts that will be addressed as part of Task 5. Existing conditions are presented for the rail, highway, sea, and air components of the regional goods movement system, as well as the warehousing and distribution centers which support the goods movement industry.

2.1 WAREHOUSING AND TRANSLOAD CENTERS

This section provides an overview of warehousing's role in the supply chain, the outlook for the market, and identifies specific trends that impact this sector. The section also addresses transloading, which is the practice of transferring goods from marine containers to/from domestic intermodal containers or trucks at a distribution center or warehouse. Warehousing and transload centers serve as storage and transfer nodes in the regional goods movement network. These nodes serve both domestic and international freight

Overview of Warehousing in the Goods Movement Supply Chain

Warehouses and distribution centers in the MCGMAP area are an integral part of the regional goods movement system. These centers are the place in the supply chain where goods merge and flow from various origins to multiple consumer end points. Some centers are proprietary within a network and serve one store chain, others may be operated by Third Party Logistics (3PL) providers that handle products for multiple customers. Some centers provide value added services or repackaging to meet specific customer demands. Some facilities provide inventory and storage service, others simply move product from international 40' containers to domestic 53' equipment.

Warehousing and distribution centers are sites for the reception, delivery, consolidation, distribution, and storage of goods. The warehousing industry can be divided into private, public, and contract functions:

- Private warehouses are generally owned by larger firms that use the facilities for the storage and distribution of their own goods.
- Public warehouses have many customers, often with short-term commitment, offer flexible services in order to compete, and normally store a variety of commodity types.
- Contract (third-party) warehouses have a dedicated customer, usually specializing in certain commodities, and offer value-added services such as inventory control and management, order entry and fulfillment, labeling, packaging, and price marking.

The study area is home to a large number of warehouses and distribution facilities, for two key reasons. First, the two largest ports on the West Coast - the Port of Los Angeles (POLA) and the Port of Long Beach (POLB) - are located side by side in the San Pedro Bay. These two ports are responsible for unloading goods arriving from Asia and other parts of the world and preparing them for distribution to centers around the United States. Second, it is very convenient for warehouse managers in the study area to have access to other Western U.S. cities such as Las Vegas and Phoenix. In addition, along with Los Angeles International Airport (LAX), which is a center for international shipping, Ontario Airport (ONT), the regional hub for United Parcel Service (UPS), has become a center for many logistics-related activities. Access to multiple transportation modes and distribution facilities makes this area a desirable logistics hub.

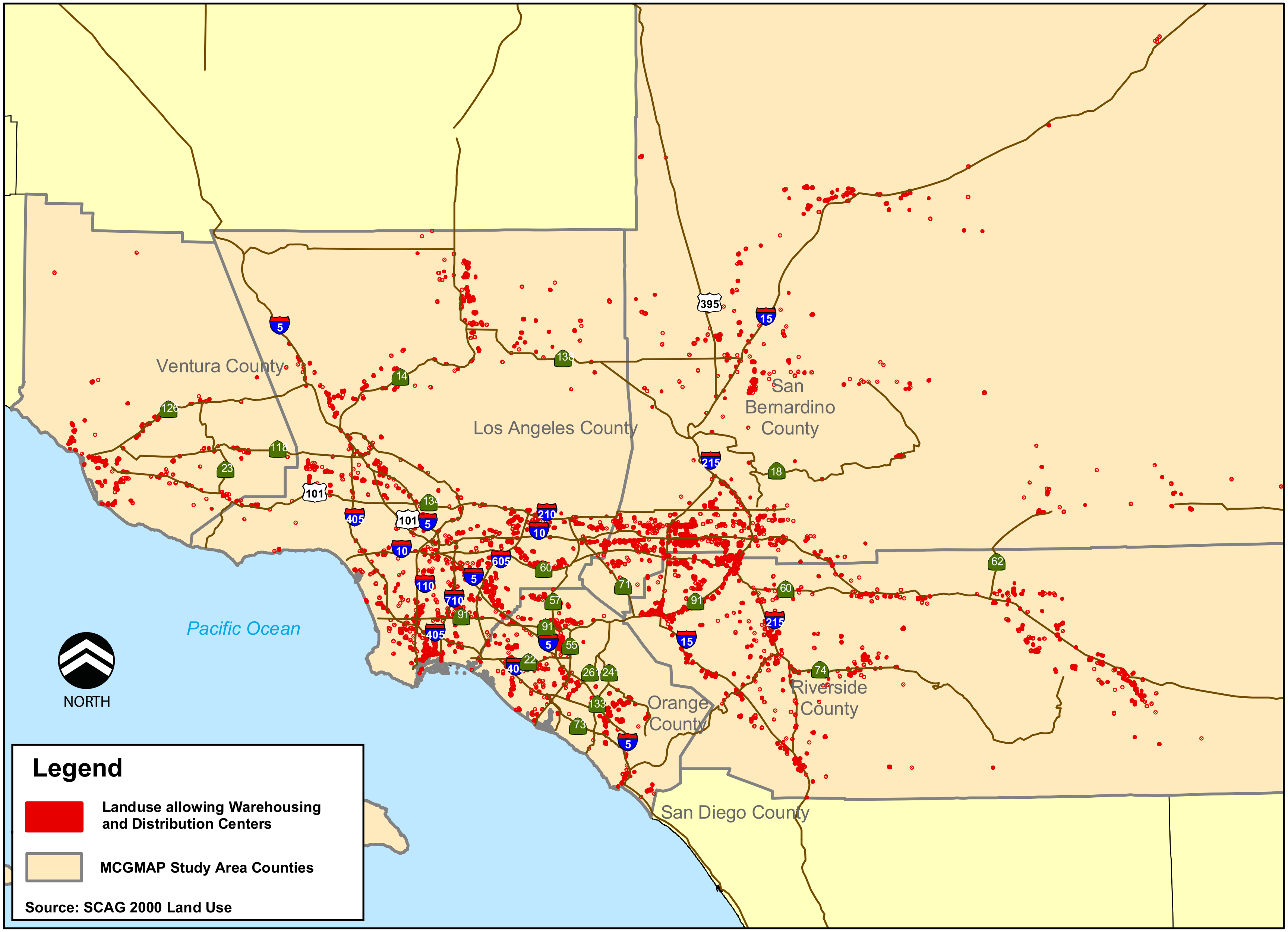
The most significant warehouse/distribution activity focuses on goods moving through the ports, airports and intermodal facilities to final destinations outside of the study area. Approximately 65 percent of inbound truck trips to these warehouse/distribution centers originate from port and airport terminals in the study area For this component of the market, the average roundtrip length of a truck trip (to/from warehouse/distribution centers) is 35 miles.

The remaining 35 percent of inbound truck trips to warehouse/distribution centers originate from local industries and railyards where domestic intermodal shipments arrive from elsewhere in North America. The average inbound truck movements are over 500 miles. The average inbound intermodal (rail) movement is over 1,100 miles long.

The nature of the truck trips related to warehouse and distribution activities typically varies, depending upon the distribution role and market area served by the warehouse. Typical distribution roles are defined as local, Pacific southwest, or regional distribution. These roles are best defined in terms of their market reach. The market reach for a local warehouse is typically within 75-150 miles, a Pacific southwest facility within approximately 250-500 miles, and a regional warehouse within approximately 750 miles of the center.

Local and regional warehouses typically are selected to serve final users within a 24-hour order placement window. Because the Southern California region is the largest population center west of the Mississippi, many domestic facilities are located in the study area. International goods come to the study area from multiple origins around the world and through local ports, seeking to merge international products coming from multiple origins to single regional inland locations (such as Memphis, Chicago, Columbus, etc.). This mixing of international cargo is usually referred to as cross docking which means little or no product is going to be delivered locally. This confluence of two types of warehousing activities (serving inbound international freight and local domestic distribution) leads to the wide dispersion of warehouse locations.

The areas in the study area where warehousing and distribution centers are allowed by zoning are shown in Figure 2.



Wilbur Smith Associates
ENGINEERS
PLANNERS
ECONOMISTS

Figure 2
LOCATIONS OF WAREHOUSING/DISTRIBUTION FACILITIES

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Warehousing Market Outlook

Industrial real estate plays a vital role in the study area's economy. Strong industrial demand and a scarcity of large parcels of available land for development continue to strengthen and add to the long-term viability of the warehousing and manufacturing sectors in the study area. As more than 40 percent of U.S. imports flow through the Ports of Los Angeles and Long Beach, industrial real estate within the study area is well-positioned by its proximity to these international ports of entry. The study area's distribution characteristics, quality of life, and abundance of skilled labor provide key advantages to businesses competing in today's world economy. Sales of core industrial investment properties and owner/user buildings continue to grow, and the long-awaited recovery in the leasing market has come to fruition. The demand for, and lack of available space for lease has stabilized rents in 2005 and will push positive rental growth in excess of 15 percent in 2006.[1]

Currently the warehousing, distribution, and manufacturing industry in the study area includes approximately 1.5 billion square feet (SF) of space, with an additional 32 million SF under construction as of the third quarter of 2005. Major commercial and industrial developers include Prologis, Majestic Realty, Watson Land Company, IDI, Overton Moore Properties, The Carson Estate Properties, and the AMB Property Corporation. Major importers include Wal-Mart, Target, and NYK Logistics. Table 1 summarizes the total square footage available and under construction for the warehousing, manufacturing and distribution industry in the study area.

Table 1
Summary of Warehouse and Industrial Space within the MCGMAP Study Area

Market Area	Net Rentable Area (SF)	Availability Rate	Vacancy Rate	SF Net Absorption	SF Under Construction	Avg. Asking Lease Rate per SF
Los Angeles County	915,852,664	5.0%	1.8%	2,956,887	8,813,316	$0.57
Inland Empire[i]	302,869,238	5.5%	1.9%	4,984,257	21,832,733	$0.39
Orange County	245,787,227	6.4%	3.6%	876,489	1,008,178	$0.61
Ventura County	59,973,660	9.2%	6.0%	434,635	616,791	$0.64
Study Area	1,524,482,789	5.99%	2.7%	9,252,268	32,271,268	$0.63

Source: National Association of Industrial and Office Properties (NAIOP) & C.B. Richard Ellis (CBRE), 3Q2005
Notes:
[i] The data used comes from a source that specifically breaks out the Inland Empire as a subregion without giving more detail at the county level.

There is an important distinction between the availability rate and the vacancy rate. The availability rate is the total amount of space available for lease expressed as a percentage of the competitive building inventory. Space that is available for lease may or may not be vacant. The vacancy rate is the total amount of vacant space available for lease as a percentage of the total inventory of space. Net absorption measures the total amount of square feet leased over a period of time, less the space that is vacated during the same period.

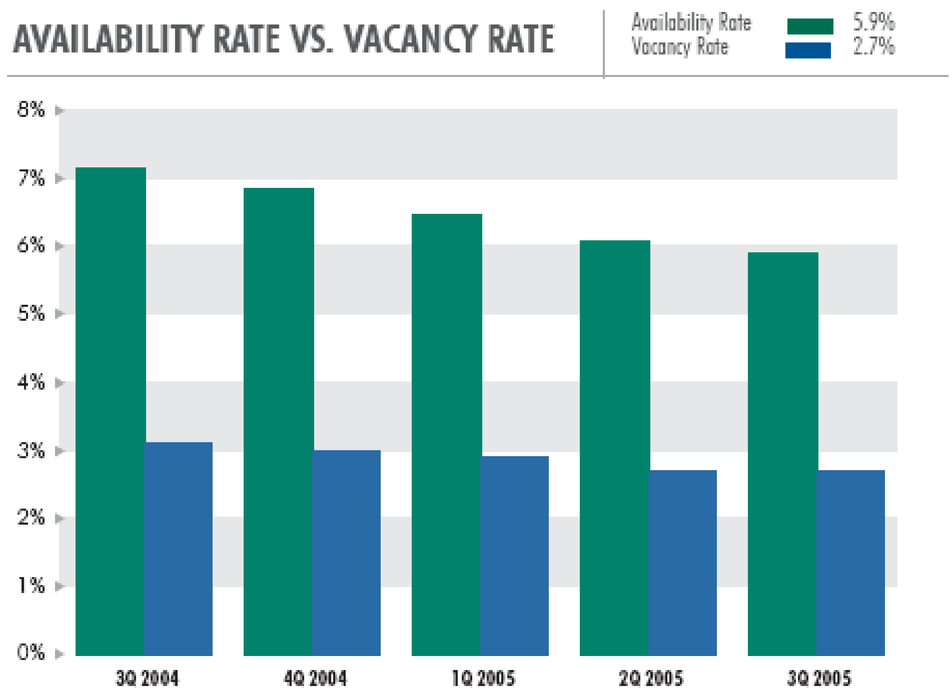
The three dominant reasons that firms have located their warehouses and distribution centers in the MCGMAP study area are:

- The two largest ports in the nation are in the study area, and are a strategic point for unloading goods arriving from Asia for distribution around the United States.
- The substantial "local" market of an estimated 17 million people living in the study area make it one of the largest consumer markets in the country.
- The study area represents the third largest manufacturing center in the nation.[2]

The significance of warehousing's impact on goods movement in the study area can also be described in terms of the annual county-to-county freight. California goods movement industry issues are driven in large measure by both the rise in U.S. outsourcing and the growing California marketplace. In the last 25 years, both California and the United States have shifted much of the domestic production and manufacturing to foreign countries with lower labor costs. As the supply chain becomes more global, California faces greater challenges to its goods movement transportation system of streets and highways, rail lines and yards, seaports, airports, and border crossings.

Figure 3 contains a series of graphs and summaries related to the warehousing and industrial market in Southern California., which includes the MCGMAP study area plus San Diego County. The figures on the following pages show several key indicators of the warehousing and distribution center marketplace: demand, price, utilization and construction activities within the study area.

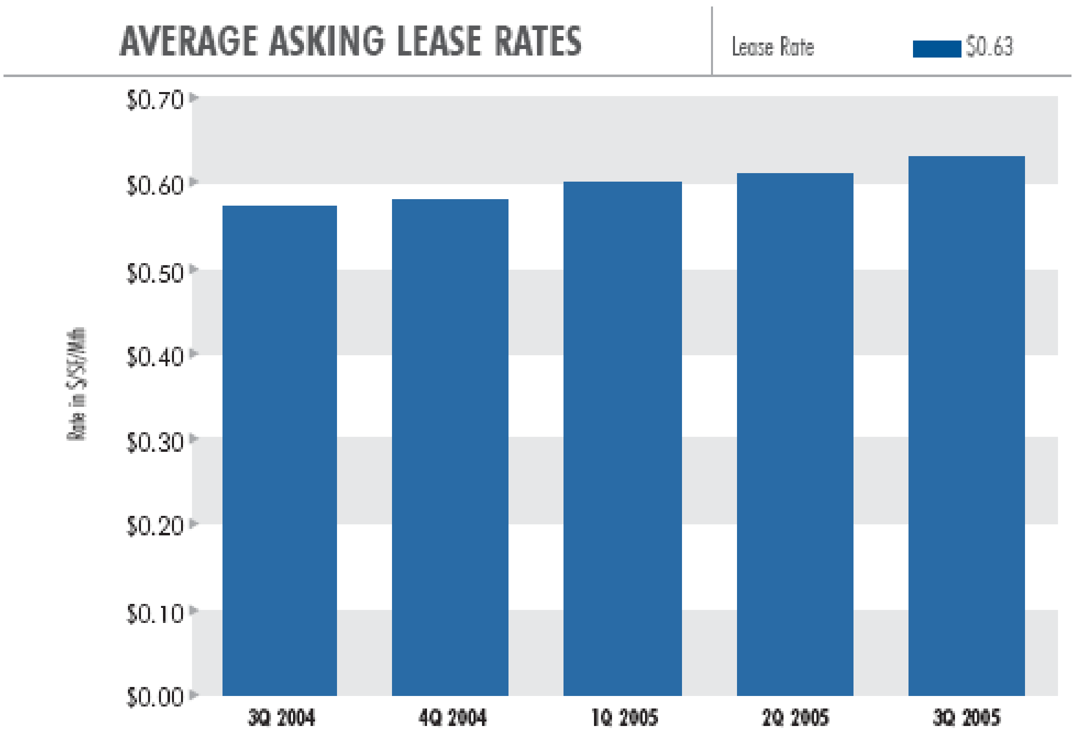
Figure 3
Southern California Warehousing and Industrial Real Estate Market



The Southern California industrial availability rate experienced another quarter of decline, while the vacancy rate held steady. The availability rate decreased 3% from 6.1% in the second quarter to 5.9%, and the overall vacancy rate remained at 2.7%. Los Angeles County holds the lowest availability rate at 5.0%, while San Diego County and Ventura County reported the highest rates of Southern California at 8.9% and 9.2%, respectively. Vacancy rates ranged throughout the five counties from the low 1.8% in Los Angeles County and 1.9% in the Inland Empire to Ventura County's rate of 6.0%.

Source: NAIOP / CBRE 3Q2005

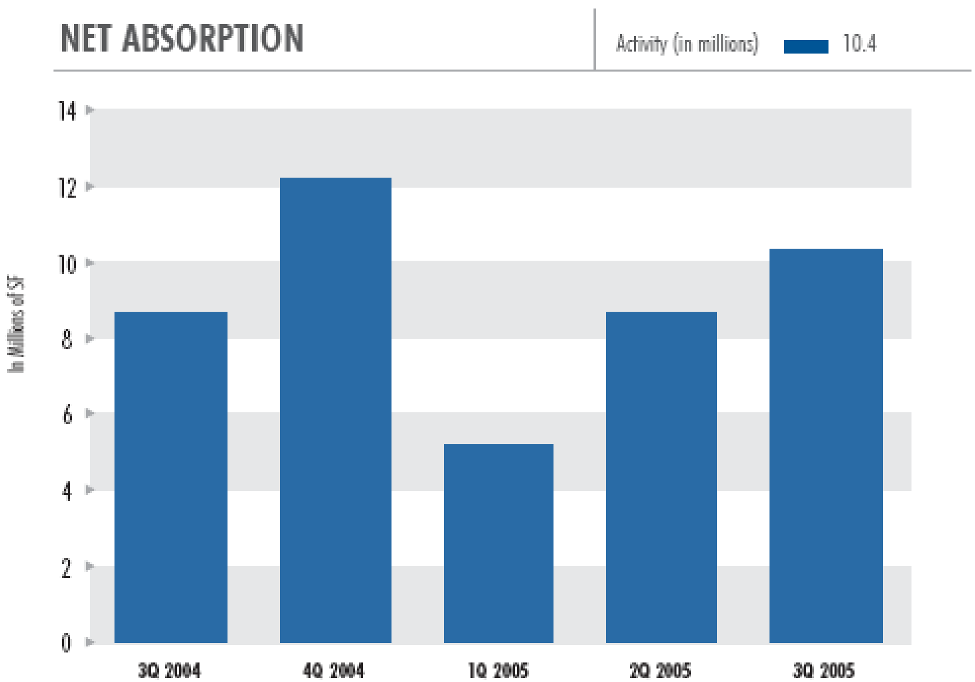
Figure 3 (Contd.)
Southern California Warehousing and Industrial Real Estate Market



The average asking lease rate for the Southern California industrial product increased an additional $0.02 this quarter to $0.63 per square foot. Contributing to this overall rise is the increases experienced in Los Angeles County, which added $0.01 this quarter to stand at $0.57 per square foot. The Inland Empire also witnessed an increase, rising $0.02 to $0.39 per square foot. San Diego County, which carries the highest lease rate in Southern California, rose $0.02 to $1.02 per square foot, and Orange County climbed $0.03 to end the first quarter at $0.61 per square foot. Ventura County declined one cent to $0.64 per square foot.

Source: NAIOP / CBRE 3Q2005

Figure 3 (Contd.)
Southern California Warehousing and Industrial Real Estate Market

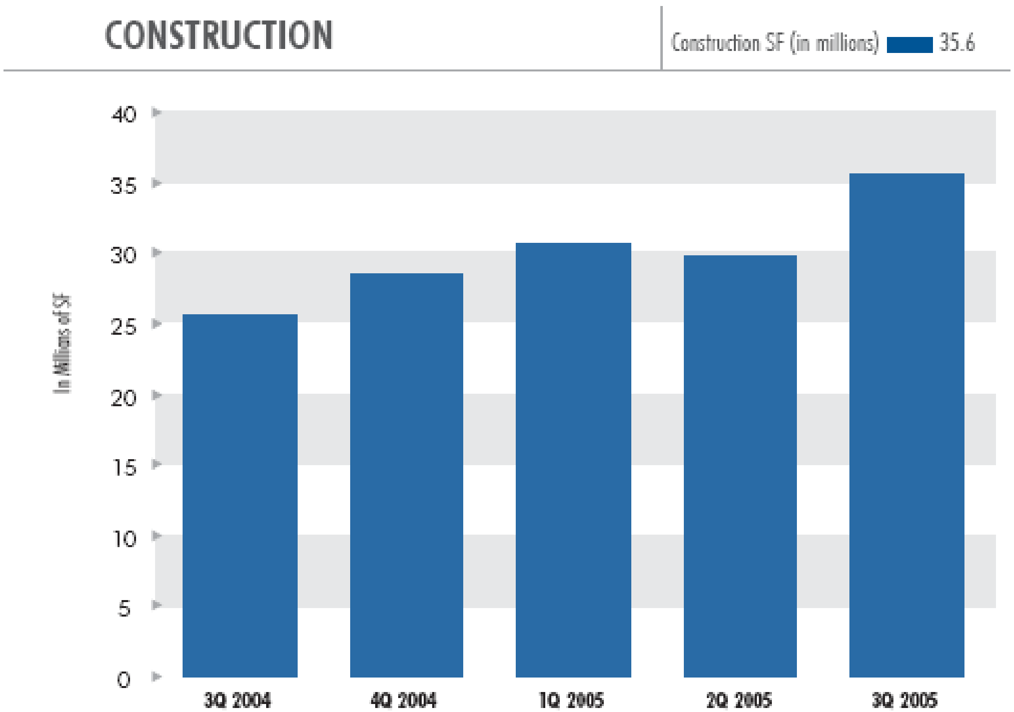


The Southern California experienced 10,365,640 square feet of positive net absorption in the third quarter, representing a 20% increase in demand. The majority of the absorption was in the Inland Empire where 4.9 million square feet was absorbed into the marketplace. Orange County witnessed a dramatic increase of positive absorption with 876,489 million square feet, as did Ventura County, which ended the quarter with 434,635 square feet of positive net absorption. However, a slowdown in activity did occur in Los Angeles County with 2,956,887 square feet of positive net absorption. Ventura County demonstrated also experience decline of demand, which resulted in 1,113,372 square feet of net absorption.

Source: NAIOP / CBRE 3Q2005

Figure 3 (Contd.)
Southern California Warehousing and Industrial Real Estate Market

CONSTRUCTION



New construction of industrial product within the Southern California market jumped to nearly 36 million square feet under construction in the third quarter. This is representative of a 20% increase over the previous quarter. The Inland Empire accounts for 61% of the total construction activity with 21.8 million square feet currently in the construction phase. Construction activity increased in every Southern California market across the board. Los Angeles County's construction rose 5% with 8.8 million square feet under Construction, while Orange County's construction activity increased 1% to end the quarter with just over 1 million square feet under construction. The construction of new space in San Diego County increased 7% to 3.3 million square feet, as did Ventura County which currently has 616,791 square feet in the construction phase.

Source: NAIOP / CBRE 3Q2005

Los Angeles County

The greater Los Angeles County area is attractive to warehousing and distribution centers due to its proximity to the ports and consumers, the large labor force available, and the existing transportation centers and hubs. There are a number of downsides, however, including:

- Many buildings are old and simply too small for current operations
- Large blocks of land for new facilities are in short supply
- Lease costs are relatively high
- Increased highway and railroad congestion

In Los Angeles County, there are three primary types and sizes of warehouses:

- Private and third-party refrigerated or cold storage warehouses are grouped near the ports, with some clustered in or near downtown Los Angeles and in Vernon. These types of warehouses tend to be less than 100,000 SF.
- Primarily third-party transloading, cross-docking, and value-added services distribution centers are grouped near the ports. These types of warehouses tend to be between 50,000 SF and 150,000 SF.
- A mixture of private and third-party warehouses are clustered in the "Mid-County" and "Gateway Cities," such as City of Industry, Santa Fe Springs, Cerritos, and La Mirada, with a concentration of local distribution for food, beverages, paper goods, etc. These types of warehouses tend to be between 50,000 SF and 150,000 SF.

According to the U.S. Census Bureau, there were a total of 1,101 warehouses and storage facilities in Los Angeles County in 2001. The Census Bureau's definition for this sector (warehousing and storage) is based on industry codes 48 and 49 under the North American Industry Classification System (NAICS). Among them, 63 percent are general warehousing and storage, 20 percent are refrigerated warehousing and storage, 10 percent are other warehousing and storage, and the remaining seven percent are for farm product warehousing and storage.

The Los Angeles industrial market remains one of the strongest markets in the study area. The availability rate for Los Angeles County continues to decline, the overall vacancy rate is also gradually declining. Construction of new industrial facilities has increased, with approximately 8.8 million SF already in the planning and development phase.

The Inland Empire

The Inland Empire (essentially defined as San Bernardino and Riverside Counties) has an especially strong warehouse and industrial market. This subarea is attractive to warehousing and distribution centers because it has areas of land available for large (one million plus SF) facilities – something that is in short supply throughout other portions of the MCGMAP study area. New development of warehousing and distribution centers is spreading from the west end of the sub area into the Moreno Valley area and north over the Cajon Pass into the high desert. The primary types and sizes of warehouses in this subarea are large private and contract warehouses and distribution centers. These types of warehouses and distribution centers tend to be in the 500,000 SF to 1.7 million SF range. As land has become scarce closer to the Los Angeles basin, large new facilities are being constructed in cities farther east such as Moreno Valley, Fontana, and Perris, and along I-15 toward Las Vegas.

The Inland Empire is becoming attractive to large sophisticated warehousing which supports more value added supply chain customization functions. Some importers are experimenting with bringing goods mostly completed and final customization is completed to match forecasts for final destination markets. Typical supply chains originating in China can span 6-11 weeks. By mass producing product overseas and customizing items closer to final markets, vendors improve their ability to provide the right quantities of the right product, more responsively. These locations in the inland empire are four days away from Midwestern markets and six days away from more dense eastern U.S. markets. Distribution and repackaging of goods (consolidation and deconsolidation) is expected to expand, driven by international trade and the MCGMAP study area's growing consumer market. The Inland Empire industrial market is expanding and developing rapidly. Almost as fast as real estate space can be constructed, unfaltering demand consumes the new capacity. The study area's growing economic base has led to improvements in local employment, personal income, retail sales, home sales, and prices. Near record-breaking activity has vaulted sales and leasing volumes to new heights. "The Inland Empire is shifting gears from being Southern California's affordable housing, blue collar Mecca to adding the kinds of income, sales, job centers, and job quality that have most recently developed in Orange County. This is the signal that the study area is reaching the final stages in its economic maturity with all of the upscale benefits that this implies."[3] Table 2 illustrates a summary of warehouse and industrial space in this area.

Table 2
Summary of Warehouse and Industrial Space within the Inland Empire

Market	Net Rentable Area (SF)	Vacancy Rate %	SF Net Absorption	SF Under Construction	Avg. Asking Lease Rate/SF	Availability Rate %
Inland Empire East[i]	93,228,068	2.1%	2,332,258	12,758,664	$0.42	5.0%
Inland Empire West[ii]	209,641,170	1.8%	3,193,453	9,074,069	$0.37	5.7%
TOTAL – Inland Empire	302,869,238	1.9%	5,525,711	21,832,733	$0.39	5.5%

Source: NAIOP/CBRE 3Q2005
Notes:
[i] Inland Empire East includes Rialto, San Bernardino, Redlands, Colton, Riverside, Corona, Moreno Valley, and Perris.
[ii] Inland Empire West includes Rancho Cucamonga, Ontario, Chino, Mira Loma, and Fontana

Orange County

In Orange County, industrial land is frequently redeveloped for retail activities. Older warehousing and distribution facilities are in the relatively more expensive northern parts of the county, due to proximity to the seaports and current consumers. New warehouse facilities are being built further to the south, where more land is available at relatively lower costs.

Most warehouse facilities in Orange County are private single user or contract warehouse and distribution centers, predominantly due to high land and employee costs. These facilities are typically less than 100,000 SF.

The Orange County industrial sector continues to be strong, with vacancy rates continuing to drop. Just over 1 million SF of industrial property are currently in the construction phase.

Ventura County

In Ventura County there are very limited warehouse and distribution facilities, relative to the other counties in the study area. The key contributing factor is the focus on agricultural land uses in the county, as well as relatively high housing costs for workers. Similar to Orange and San Diego Counties, most warehouse facilities are private and contract warehouse and distribution centers. These facilities are typically less than 50,000 SF.

The Ventura market is relatively stable with slightly declining vacancy levels and moderate increases in available space. The development of new industrial space has regained momentum.

Trends in Warehousing

Below is a summary of industry trends in warehousing that have implications for goods movements in the study area:

- Warehouses are evolving from bulk storage facilities to value-added or customization centers where goods are prepared as floor-ready merchandise for retail stores based on the latest point-of-sale data.
- As warehouses provide more value-added services (i.e., customization, etc.) and implement more technology to help move goods faster, cheaper, more economically and better, an area's labor quality and availability becomes more critical.
- In order to shorten supply chain transit times, some high volume warehouses are being designed for throughput operations (cross-docking or transload) much like truck terminal operations. This requires facilities to be designed with more doors, yard storage, and staging areas.
- Corporations are using their supply chain and warehouse networks to support their business plans and gain a competitive advantage in their marketplace. It has been said that Wal-Mart is a supply chain company that just happens to have retail outlets. Many corporations are trying to emulate the Wal-Mart example.

- Mega-sized facilities incorporating the latest innovations in warehouse design, layout and management systems are leveraging automation and advanced materials handling systems. Products are being sorted and segregated by their velocity within the distribution network. High volume fast moving products tend to be clustered together and often move in separate high velocity supply chains.
- Due to the recent Hours of Service legislation, shippers are realizing the importance of making warehouse operations more "truck driver" friendly (i.e., shipping documents ready and freight staged for quick load-out, faster equipment turnaround and a greater emphasis on trailer pool operations.) This effort to reducing driver wait time, often leads to larger, load storage and staging areas. In other words instead of having drivers wait for an unloading appointment, facilities are allowing the drivers to drop full loads and pick up stored or staged empties to reduce the driver's waiting time. Yard hostlers then position the trailers to the dock doors as space becomes available.
- Warehouse labor supply will continue to be tight. Companies need to improve hiring and retention programs in order to maintain quality workers who will meet the warehouse customers' stringent requirements.
- Just-in-time (JIT) inventory strategy has swung back to a just-in-case (JIC) inventory plan, where increasing amounts of safety stock are placed throughout the warehouse network and supply chain due to sagging service levels of the rail carriers. JIT is an inventory strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs. This method requires that producers are able to accurately forecast demand. JIC inventory strategies provide a buffer in case shipments are delayed or late. JIC also provides safety stocks to offset unreliable demand forecasts.
- Corporate America continues to push for doing more with less. Logistics and warehouse managers will be challenged constantly to implement innovative cost-savings and productivity improvement tactics. These strategies are often based on new technologies and wireless tracking devices and more information collaboration with partners in the supply chain.
- Continued increase in fuel cost for trucking companies will result in the carriers' increased effort to reduce empty miles and bob tail movements.
- Logistics and warehouse managers' jobs are getting more complex as international complexity, carrier capacity short falls and order fill accuracy expectations increase.

Growing imports from China, Japan, South Korea, Taiwan and Thailand are revolutionizing global logistics. Corporations have increased their supply chains and logistics activities significantly by moving an increasing amount of manufacturing to China and Southeast Asian countries. This has increased the complexity of, and the challenges to, achieving fast, efficient and dependable goods movement. In an effort to offset these new challenges, corporations have invested millions in sophisticated supply chain information systems to gain goods movement visibility. Historically when international supply chain activities amount to less than 10% of the importers activities many of the processes were manual. Today it is typical that more than 40% of a companies' product line moves in extended international chains. Due the extended time in transit, there is an increasing need for integrated supply chain visibility between vendors, carriers and resellers.

The consolidation of logistics companies continues to affect the locations of warehousing and distribution centers. As major third-party logistics provider companies grow in size and scope from mergers and acquisitions, they try to gain a competitive edge by providing international shippers with "one-stop" for various goods movement services. These larger 3PL companies have the capital, processes, and technology to significantly increase the sophistication of goods movement.

Increasingly stringent customer service requirements are one of the main drivers changing the warehousing and distribution industry. Wal-Mart, Target Stores, Kohl's, and other mass retailers continue to impress customers with exceptional customer service (e.g., accepting product returns without receipts, out-of-stock product price guarantees). These mass retailers' vendors must then follow suit. The same strong customer service positions are now visible in the automobile, consumer electronics, furniture, toy, and apparel industries. Corporations use their supply chain and warehouse networks to meet these increasingly stringent customer service requirements. Warehouse operations use advanced software systems, e.g., real time data capture and RFID, to identify and expedite orders and document processing. Goods are customized into floor-ready merchandise to meet each customer's special requirements. The availability of a trainable workforce with a good work ethic has become more important in warehouse location decisions. In order to meet changing customer demands, warehouse facility designs are beginning to incorporate a higher ratio of container or trailer yard staging space per dock spots (2 ½ to 3 yard spots per dock door), increased area within the warehouse for product customization and value-added service work, and high-speed fiber-optics infrastructure to the site location.

Over the next few years, the warehousing and distribution industry in the MCGMAP study area is expected to grow at double-digit rates to parallel the growth in imports. Nevertheless, retailers in search of lower real estate and labor costs are establishing regional distribution centers away from major transportation hubs such as Los Angeles, and diversifying their supply chains to include East Coast facilities. Risk management is becoming a higher priority as many companies have been harshly impacted by recent natural disasters and fear the potential of future terrorist activities. As a result of these concerns, new site locations are being sought 200 miles or more inland, with equal access to two or more ports. This new trend in location strategy is based on the theory that this will improve the overall reliability of the supply chain.

Additional issues affecting the warehousing and transloading industry are presented in Section 4.0 of this report.

2.2 FREIGHT RAIL

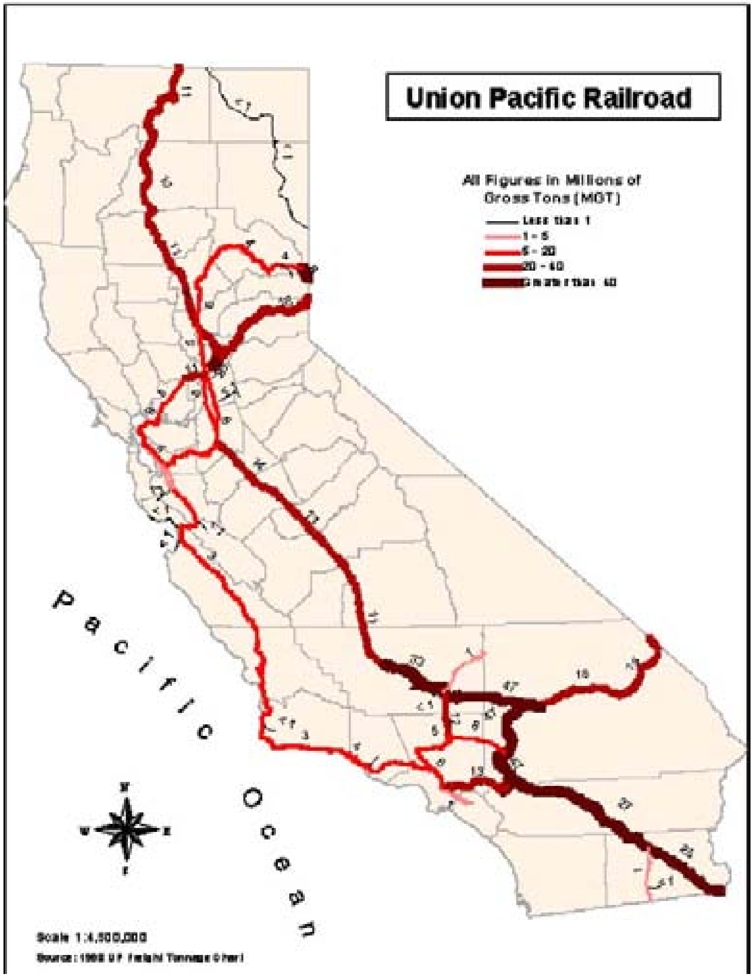
Railroads have been involved in moving freight to, from and through California for over 140 years. There are 31 freight railroads in California operating over 7,420 miles of track[4] The Union Pacific Railroad (UP) operates the largest portion of the rail network, responsible for 3,708 miles of track. The Burlington Northern Santa Fe Railway (BNSF) operates 1, 889 miles or about 25% of the State's rail network. The remaining 25% of the state track miles are served by regional and shortline carriers. The California State Rail Plan stated that in 2002 more than 55 million tons of rail freight originates in California and 87 million tons terminated in the state.[5]

With an extensive network throughout the MCGMAP study area, rail serves as a vital link in the goods movement supply chain. This mode is best known for its ability to move large volumes of goods over long distances. Existing rail facilities are extensive throughout the study area, served by two Class 1 railroads, the BNSF and the UP. These carriers connect Los Angeles to the gateway cities and intermediate markets of Chicago, Kansas City, Memphis, Dallas, St. Louis and New Orleans. From these gateways, freight is often transferred to eastern carriers who deliver shipments to dense eastern markets such as Columbus, Detroit, Boston, New York/New Jersey, Philadelphia, Baltimore, Norfolk, Atlanta and Jacksonville. These two railroads are also linked to the Mexican and Canadian rail systems.

Intermodal is one railroad business segment which includes the movement of international and domestic containers and trailers. Fifty percent of all international container traffic moves via intermodal service to inland U.S. points, another 12 percent of these international containers are transloaded to domestic 53' domestic containers, and move inland for final delivery[6].

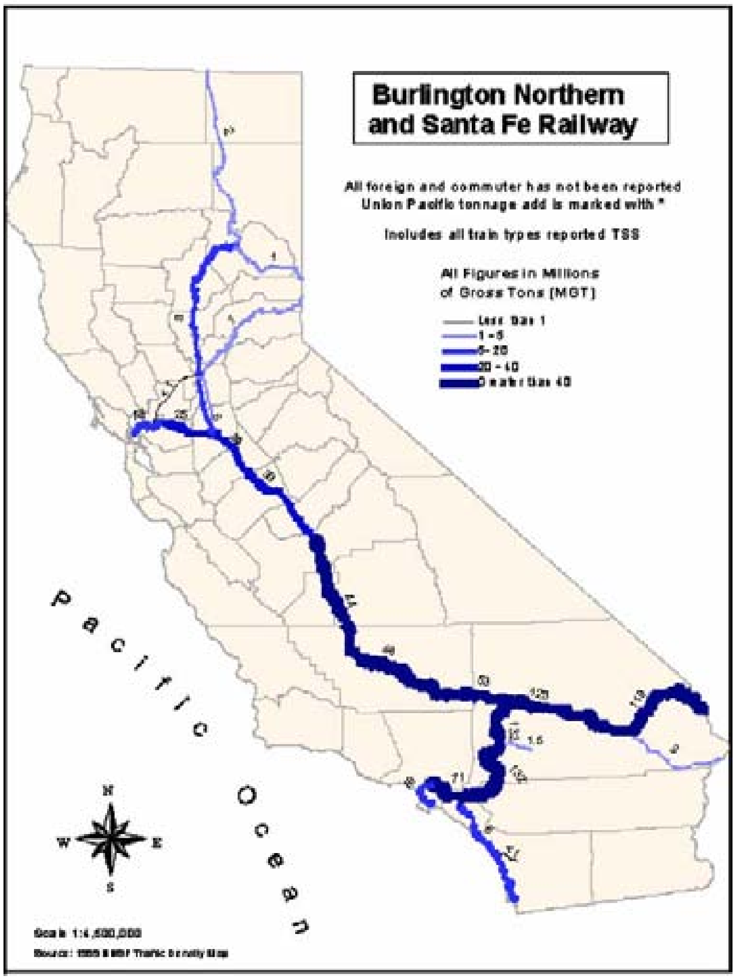
The railroads' mainlines in California and portions of Nevada and Oregon appear in Figure 6. In the study area, the railroads carry all forms of rail traffic: boxcar, tank, lumber and dimensional flat cars, intermodal containers, finished automobiles, and rail carload traffic.

Figure 4
Union Pacific Railroad Freight Density Year 2002
Million Gross Tons (MGT)



Source: California State Rail Plan 2001-02 to 2010-11, Caltrans, 2002

Figure 5
Burlington Northern Santa Fe Railroad Freight Density Year 2002
Million Gross Tons (MGT)



Source: California State Rail Plan 2001-02 to 2010-11, Caltrans, 2002

Figure 6
RAILROADS AND MAINLINES IN THE MCGMAP STUDY AREA SERVING CALIFORNIA, ARIZONA, NEVADA, AND OREGON

Rail Cargo Market Sectors

The following presents an overview of the various rail market sectors (intermodal, automobiles, and carload), provides an inventory of the rail system, and outlines the various types of facilities and their operating characteristics. Section 4 – Constraints, Issues, and Problems summarizes the specific issues related to the existing freight operations in the study area.

Intermodal

The Ports of Los Angeles (POLA) and Long Beach (POLB), known collectively as the San Pedro Bay ports, are major generators of rail goods movement traffic through the study area. Port-related container traffic growth has been double-digit for more than a decade. The UP and BNSF move an estimated 40 percent of all international containers through the study area (many of these are empty westbound containers) as part of their intermodal service.[7] An Alameda Corridor Transportation Authority (ACTA) study conducted in 2004 estimated that the railroads also transport another 12 percent of what had been international containerized cargo in domestic containers.[8] This is cargo that had been warehoused or transloaded in the study area before being transported in domestic containers eastbound. The value of POLA and POLB container cargo transported by rail was about $113 billion in calendar year 2004, based on rail intermodal's share of the declared value of container cargo moving through the San Pedro Bay ports at $218 billion.[9]

In addition to port-related traffic, UP and BNSF transport a large number of domestic containers, adding billions of dollars to the total value of intermodal cargo in the study area. Domestic intermodal cargo includes customers such as UPS, U.S. manufactured food products, and high value merchandise, e.g., cigarettes and alcohol.

Over time, intermodal shipments have become predominant in the freight rail traffic mix in the study area. The emergence of the intermodal sector initially gained strength following the deregulation of the railroad industry in the 1980s. As a result of both deregulation and service improvements, much of carload traffic shifted to intermodal. The shift from carload to domestic intermodal was largely completed during the 1990s. Also, there was a big shift of over-the-road truck traffic to intermodal after trucking was deregulated. With driver shortages and increased fuel costs more trucking companies have found ways to use the long haul rail network as driver substitute service. It is important to note that the process of transloading from marine containers to domestic containers is contributing to the "appearance" that the domestic intermodal segment is growing at a rate comparable to the international growth rate (which is higher).

Domestic containers are larger than international containers. While domestic containers are typically between 48 feet and 53 feet in length, standard marine containers are characterized as 20 feet, 40 feet, and 45 feet long, with 40 feet being most common length.

Intermodal Markets - Intermodal trains operate between the MCGMAP study area and all major Eastern markets and rail gateways. In many instances, multiple schedules are destined for the same general market. This service segmentation is driven by customer needs and a recognition that the carriers can charge a premium rate for a day faster service.

UP also operates intermodal service to the Pacific Northwest and the Bay Area from the Basin. BNSF does not offer any intermodal service between the Basin and the Bay Area, the Central Valley, or the Pacific Northwest.

Intermodal Complexity - As the mix of railroad traffic continued to change from carload to intermodal, the railroads converted some carload yards to intermodal facilities. Examples of this are the Hobart Yard on BNSF and East Los Angeles (East LA) on UP, where each has been incrementally converted from carload classification centers and cross dock operations to intermodal facilities over the past 30 years. Each conversion represented a ready opportunity for the railroads in that they did not have to acquire property or comply with provisions of the California Environmental Quality Act (CEQA), since the prior and subsequent use of the properties were for railroad purposes. This type of railroad property conversion has taken place all over the U.S. as "intermodalism" has come to dominate the property needs of the railroad industry.

The railroads have invested heavily in articulated double-stack (containers stacked two high) rail cars for three significant reasons:

- Articulated configuration provides a better ride for the load, because it diminishes the in-train slack action thereby reducing in-train forces which results in load damage.
- Increased cargo density allows for the reduction of overall train length. Train length is critical in all corridors due to the limited length of many track sidings and passing tracks.
- The amount of terminal space needed to load and unload cargo. Since the number of loaded well slots per car is a railroad measure of productivity for all intermodal facilities, the objective is to have all the wells in a car fully utilized. A typical articulated rail car has five wells, although there are single and three-well rail cars in the system. Figures 7 and 8 show typical three and five well articulated rail car configurations. Railroads are also purchasing non-articulated, one-well cars. The reason for this variance in car well size is to allow the originating terminal to load (or block) a single well car with boxes all destined for the same final terminal. The loading objective is to fill all wells two high. A typical five-well railcar can be loaded with ten 40-foot containers (some lower wells can be loaded with two 20-foot containers, or with containers slightly longer than 40 feet; upper containers can be longer than 40 feet, but no 20-foot containers ride as upper containers).

Figure 7
Photo of a 3 Unit Articulated Intermodal Rail Car
(Carries 6 Containers, Double-Stacked)

Source: Charles Biel's BNSF Photo Archive.

Figure 8
Photo of a 5 Unit Articulated Intermodal Rail Car
(Carries 10 Containers, Double-Stacked)

Source: Charles Biel's BNSF Photo Archive.

The difficult aspect of the use of multiple-well, articulated, high-capacity double-stack railcars is that many on-dock intermodal facilities do not generate sufficient multiple double-stack car volume for some destinations. This is particularly true at the on-dock intermodal facilities, which are largely single-user or ocean carrier consortium-specific facilities. For example, in order to fully fill a 5-well (or unit) car for a single destination, ten 40-foot containers are required. The five-well car unit consists of one 40-foot container atop another in each well; alternatively, two 20-foot containers can be loaded in a well, with a 40-foot container on top, as shown in Figure 8. To load a 3-well car, six 40-foot containers for the same destination are needed. To load a 1-well car, two 40-foot containers are needed. Thus the difference in car sizes offers flexibility.

Railroad-owned near-dock facilities (intermodal facilities located within a few miles from port areas) have the advantage of being able to mix loads from multiple sources to single destination terminals. By combining the containers from multiple marine terminals, the railroads are able to generate more efficient blocks of cargo and have the density to build 8,000-foot long trains. For line haul productivity reasons, the railroads prefer a train length of about 8,000 feet. This figure is only constrained by the length of the passing tracks along the network. An 8,000-foot long container train typically carries 240 containers. If a single on-dock facility does not generate that much volume, international containers landed there may go instead to a rail consolidation facility such as UP's Intermodal Container Transfer Facility (ICTF) or the BNSF's Hobart terminal.

The intermodal volume in the MCGMAP study area in the last four years, including on-dock, appears in Table 3. The table shows units by year. A unit is a container, regardless of size.

Table 3
MCGMAP Study Area Intermodal Volume in Units for 2001-2004

Year	Volume (Units)	Annual Growth Rate
2001	3,692,055	-
2002	3,894,137	5%
2003	4,251,982	9%
2004	4,673,128	10%

Sources: UP, BNSF Intermodal Data, 2005

The intermodal volume shown above includes both international and domestic container shipments. Nearly all growth was from an increase in port-related volume. The percent of San Pedro Bay port container throughput loaded at the on-dock facilities was 18 percent in 2004 and about 21 percent in 2005. In 2005, BNSF pushed more westbound trains to the docks (from Hobart) and ocean carrier Orient Lines commenced using an on-dock facility.

Transloaded Intermodal Cargo – An emerging market related to the intermodal market sector is the transloaded sector. In transloading, the goods are sometimes transferred immediately (cross-docked) or after the goods are handled/stored for short period of time in the warehouse to accommodate value-added services (e.g., bar codes or labels are added; hangers added to apparel; mixing of products to make loads for specific retail stores). Many of the large shippers of intermodal cargo (such as Wal-Mart and Target) transload cargo from ocean carrier containers to domestic containers, which are then transported via rail or long-haul truck to inland destinations.

This is a growing segment and has been the topic of research of late, with two recent studies providing some insight about the scale of this segment. The SCAG Port and Modal Elasticity Study estimates that 40 percent of all containers flowing through the San Pedro Bay ports are "shipments trans-loaded into other vehicles for movement outside the region plus marine containers trucked outside the region," but does not indicate what share is actually transloaded.[10] The 2004 Alameda Corridor Transportation Authority study estimated that 12 percent of all rail intermodal traffic to/from the study area is transload/cross dock, while 18 percent of the study area's port-related traffic trucked outside the study area is transload/cross dock.[11] This would imply that 30 percent of all of container traffic goes through some transload/cross-dock activity.

Automobiles - Private carriers estimate the value of automobiles distributed from railroad facilities in the study area to be about $25 billion annually, assuming an average retail price per unit of $25,000. The value of imported automobiles shipped out of the area from these facilities by rail is about $7.5 billion annually.

Domestically manufactured automobiles purchased in the study area are primarily distributed from UP's Mira Loma facility. This facility serves GM, Ford, Chrysler, and some foreign manufacturers with production plants in the U.S., such as Isuzu and Toyota. Annual volume at Mira Loma is about 900,000 units, transported on about 70,000 railcars.[12] Domestically manufactured Hondas are distributed throughout the study area from a BNSF facility in San Bernardino. This amounts to about 132,000 units annually. Honda uses a National City (San Diego County) loading facility for its imported automobiles.[13] The imported units are about 125,000 annually; 80 percent are transported through the study area to Eastern markets.[14]

Toyota recently opened an import facility at Benicia, California, to serve Northern California and markets east of California. Toyota is studying the potential for moving all of its U.S. manufactured cars for shipment to overseas markets to Benicia from POLB. This is because Toyota's lease at POLB expires in 2006, and the size of its terminal will be much smaller under a new lease. The new business plan of Toyota is being driven by the need of the POLA and POLB to support burgeoning container operations. Toyota's domestically produced automobiles are distributed from Mira Loma. Until recently, Toyota used POLB property to distribute all of its imported and domestically produced automobiles in California. Toyota will continue to serve Southern California markets from POLB.

Nissan imports through POLA and distributes both imports and domestically produced automobiles from its marine terminal there. It is possible that Nissan imports destined to Eastern points may eventually shift to another port because of competition for dock space, and the domestically produced product could potentially migrate to an inland rail facility. Whether this occurs or not depends on market forces that are difficult to predict with precision.

The Port of Hueneme is a key gateway for automobile imports. The port is currently seeking additional property to expand parking capacity in order to allow increased automotive shipping activity at the port.

Carload Traffic

In the rail industry, carload traffic refers to cargo moved in or on boxcars, gondolas, tank cars, flatcars, and other conventional railroad vehicles. Typical carload commodities include agricultural products such as grain and fertilizers, lumber, paper, scrap metal, coal, aggregates, chemicals, steel, machinery, and consumer products and food stuffs, among many other things. Trains carrying this traffic are sometimes called carload or manifest trains. With some exceptions, carload traffic is generally low-value, heavy, bulk products.

Carload traffic is a major component of the rail goods movement but it has decreased in importance over the years and now represents about a third of the rail goods movement in the study area. In absolute terms, carload traffic declined as merchandise, canned goods and time-sensitive traffic shifted to intermodal and as more manufacturing (which depended on rail as a key part of its logistical supply chain in the past) has moved overseas. Manufactured products from overseas now come to the U.S. in marine containers in increasing numbers and are delivered to consumers in intermodal transportation service. With increasing energy costs the demand for coal and local energy sources has increased. Export grain and agricultural products have also grown placing increasing demand on rail networks for new unit train starts.

Consistently accurate data on carload values is not readily available. Nonetheless, approximately one third of the total number of freight unit trains generated throughout the study area is carload, the remainder consisting of intermodal trains. Carload trains, however, also include rail cars loaded with automobiles. Based on this, it is estimated that carload volumes actually represent less than a third of the overall rail market volume in the study area.

Intra-Regional Rail Traffic

A small amount of rail traffic has origin and termination points inside the study area. For example, some carload aggregates (gravel) move from Cabazon to a batch plant in Gardena. Gypsum from Plaster City (Imperial County) moves to a Santa Fe Springs wallboard manufacturing plant, and BNSF operates a unit train (a train handling carloads of a single commodity) of imported slab steel from the San Pedro Bay ports area to a rolling mill at Fontana. The Los Angeles County Sanitation District (LACSD) plans to commence operation of solid waste trains between the existing City of Industry transfer facility and the proposed Mesquite Regional Landfill (MRL) in Imperial County in 2009.[15] There is no intra-regional transport of intermodal or automobile traffic.

Inventory of Systems

In the study area the BNSF Railway and UP Railroad are the two major railroad systems that form a base network for goods movement. Rail freight volumes move to a lesser degree via publicly owned track and short lines. The following describes these systems and presents the train freight volumes on BNSF and UP mainlines.

Burlington Northern Santa Fe Railway

BNSF's east-west mainline is designated by the railroad as Transcon, a term reflecting its continent-crossing nature. The Transcon's western terminus is the Alameda Corridor near downtown Los Angeles.

The Transcon is the BNSF artery linking the Los Angeles Basin to all Midwestern, Southwestern and Eastern markets on the BNSF rail system. These markets include Kansas City, St. Louis, Chicago, Memphis, Dallas, Houston, New Orleans, Denver, El Paso, Albuquerque, and Phoenix. In the Cajon Pass segment of Transcon, BNSF operates 90 to 100 trains daily on a double track rail line (this will soon expand to a triple track). More than 95 percent of Transcon is double track.

The Central Valley north-south line links Transcon to the Bay Area and the Pacific Northwest. BNSF reaches the Central Valley first by its mainline running west from Barstow to Mojave, then through Tehachapi Pass via trackage rights on the UP before reaching BNSF Central Valley mainline track from Bakersfield. Trackage rights are granted by one railroad to another for the use of its track. The granting railroad allows the grantee railroad use of its track, typically for a fee that covers the incremental cost triggered by the grantee's use of the track. The Bay Area terminus of the Transcon is in Richmond. The BNSF north of Stockton runs on UP via trackage rights to Keddie in the Sierra Nevada foothills, then on BNSF trackage to Portland and Seattle in the Pacific Northwest. BNSF's Pacific Northwest route is circuitous relative to the competing UP route. It is used for the transport of forest products and for re-positioning empty intermodal rail cars (cars that carry trailers and empty containers) to the Los Angeles Basin.

As noted, between Mojave and Bakersfield and through Tehachapi, BNSF operates on track owned by UP. This segment of track is highly congested with BNSF and UP traffic. All of the BNSF's intermodal trains from the Bay Area and Central Valley operate on this route. In addition, 25 miles of the segment lies on a 2.5 percent grade, a particularly difficult operating environment for railroads. Train volume is about 50 trains per day during busy parts of the week. Because of topography, building additional capacity by adding a second main track through the steep grade segment would be extremely expensive and difficult. This rail line constraint is a major reason why BNSF does not aggressively seek to haul more international containers through the Port of Oakland.

BNSF has been particularly aggressive in changing its intermodal business practices to absorb the surge of container traffic through the San Pedro Bay ports. In both 2003 and 2004, virtually all intermodal growth in the study area was on BNSF. The growth between 2002 and 2004 was about 780,000 container units. BNSF has adopted a strategy of operating 8,000-foot container trains, whereas it operated 5,000-foot to 6,000-foot trains in the past. This operational change has allowed BNSF to absorb all new business over the last two years without increasing train starts. This is a tremendous productivity achievement. In addition, BNSF has changed its business practices at Hobart Yard, where it established an appointment system. The system accelerates inventory turnover and reduces chassis storage. It also is converting container storage from a wheeled operation (container on chassis) to stacked operation (containers set one atop another, thus reducing space requirements for storage). These steps are innovative departures from the operation of most railroad intermodal facilities.

Union Pacific Railroad

UP has two lines running east-west from the Los Angeles Basin. One is the Sunset Corridor, which extends to El Paso, Texas, and beyond, and the other is the South-Central Line, which extends to Las Vegas, Nevada, and beyond. The two lines cross at Colton, at a point appropriately called Colton Crossing. The El Paso route is designated as the primary intermodal lane between the Los Angeles Basin and Eastern markets. The line connects the study area with locations such as Tucson, Phoenix, El Paso, San Antonio, Houston, New Orleans, Dallas, Memphis, Kansas City, St. Louis, and Chicago. About 40 percent of the line between the Los Angeles Basin and El Paso is double track (two parallel mainline tracks). UP operates up to 50 trains a day on the route. Constrained Sunset Corridor capacity is an issue, and UP currently operates several intermodal trains over its South-Central Line that it would otherwise route on the Sunset Corridor.

UP's two Los Angeles Basin lines, the Los Angeles Subdivision and the Alhambra Subdivision, discussed in the following section, are connected to the Sunset Corridor at Colton. The Los Angeles Subdivision segment of the mainline connects with the El Paso Line just east of Sunset Corridor at Colton Crossing via the BNSF Transcon between West Riverside and Colton[16]. The Alhambra Subdivision's eastern terminus is at West Colton Yard, the western terminus of the Sunset Corridor. UP's 50 daily trains on the Sunset Corridor are considered to be the maximum capacity on a mainline with passing and meeting sidings and a mix of train types. The sidings are comparatively short segments of track parallel to a mainline with switches at either end. This arrangement allows two trains approaching each other from opposite directions on a single track mainline to pass or meet each other.

The South-Central Line is another route to eastern markets. This line is the primary rail route to Salt Lake City and Denver from the Los Angeles Basin. In addition, the line is well situated to serve the upper Midwest. Though the South-Central Line connects to lines radiating into the Gulf Coast area, routing traffic this way would be circuitous; thus, the line is not used for such moves.

UP's Los Angeles Basin lines are connected to the South-Central Line in two ways. The Los Angeles Subdivision connects via trackage rights over the BNSF Transcon between West Riverside and Daggett (east of Barstow), where UP's mainline to Las Vegas begins. The Alhambra Subdivision connects via the UP's Mojave Subdivision main line from West Colton Yard northward over Cajon Pass trackage, via a connection to the BNSF Transcon near the top of the pass, and the Transcon then via BNSF trackage rights to Daggett. UP operates 20 to 25 trains each day on the South-Central Line.

UP has two north-south routes from the Los Angeles Basin. Running north from Los Angeles on the same track, the two routes diverge at Burbank. One goes north from Santa Clarita to Palmdale and on to Mojave, Tehachapi Pass, and the Central Valley. The other goes west to Oxnard and Santa Barbara. The route to Palmdale is designated the Santa Clarita Line, and the second is known as the Coast Line. Ownership of line from Los Angeles to Chatsworth is shared between UP and Metro; ownership of the line from Chatsworth to Moorpark is shared between UP and the Ventura County Transportation Commission (VCTC).

UP operates from Los Angeles to Palmdale on track owned by Metro. From Palmdale north to the Central Valley, UP operates on its own track. UP's Central Valley mainline continues to Sacramento. UP has its Mount Shasta Route to Portland and Seattle. The Los Angeles County-owned portion of this route between Los Angeles and Palmdale is maintained by the Southern California Regional Rail Authority (SCRRA), which sponsors Metrolink commuter train service between Lancaster and Los Angeles. On a typical day, UP routes four intermodal trains going between the Basin and the Pacific Northwest over the Santa Clarita Line.

The Coast Line links the Los Angeles Basin with the Bay Area. At San Jose, the route splits into two lines, one to Oakland and the other to San Francisco. The line to San Francisco is owned and maintained by the Peninsula Commute Joint Powers Board, which sponsors the Caltrain commuter rail service; the line to Oakland is owned by UP. In Oakland, the line connects to the historic Overland Route Donner Pass line to the Midwest and at Sacramento and Roseville to the

UP Shasta Route to the Pacific Northwest. The Coast Line is used sparingly for freight service. There is a great deal of interest in the Coast Line as a passenger train route between urban areas. In addition to local service, UP operates two conventional carload trains each day from Roseville to the Basin on the Coast Line. Opposite direction counterpart trains are operated between the Basin and Roseville. These trains avoid the UP's classification yard at West Colton and deliver cars directly to industrial distribution facilities situated in the Basin. UP also operates a Basin-to-Bay Area intermodal train each day on the line, and uses the line to re-position empty intermodal equipment from the Port of Oakland to the Basin. The southern segment of the Coast Line, from San Luis Obispo to Los Angeles, is part of the Los Angeles to San Diego (LOSSAN) Corridor.

Bridging a gap between the north end of the Santa Clarita Line and the west end of the Sunset Corridor is the Palmdale-Colton Cutoff. UP's Palmdale-Colton Cutoff (Mojave Subdivision) bridges the gap between Palmdale on the Santa Clarita Line and the west end of the Sunset Corridor at West Colton Yard. The line was constructed in the late 1960s to reroute trains around downtown Los Angeles. UP uses the Cutoff for carload traffic to/from the Bay Area, the Central Valley, and the Pacific Northwest. UP routes a Houston-bound intermodal service from the Port of Oakland over the Palmdale-Colton Cutoff to the Sunset Corridor. UP operates about 15 trains each day on the Palmdale-Colton Cutoff.

UP operates trains of less than 8,000 feet on its South-Central Line, as the siding lengths are not long enough to handle 8,000-foot trains. The Sunset Corridor has 8,000-foot sidings, and UP attempts to operate container trains of that length on that route.

UP has been less aggressive than BNSF in changing its intermodal business practices. For example, UP's operation is 100 percent wheeled. Also, UP has not reduced chassis storage at their facilities in any meaningful way. UP recently started a pilot program at facilities in the Midwest to encourage chassis pools with the goal of reducing on-site chassis storage.[17]

BNSF and UP Lines in the Los Angeles Basin

There are three east-west rail lines in the Los Angeles Basin. These lines provide connections between Los Angeles and the transcontinental rail system. International container traffic going to and from the POLA and POLB is routed over these lines. These lines are the BNSF Transcon west of San Bernardino, the UP Los Angeles Subdivision, and the UP Alhambra Subdivision. These lines are shown in Figure 9. A complete description of the configurations of the study area rail lines, including number of tracks, is included in the Inland Empire Railroad Main Line Study Final Report (Southern California Association of Governments, June 30, 2005).

The three Basin lines transport more than 98 percent of all Los Angeles and Long Beach port intermodal traffic (which accounts for about 52 percent of port container traffic in the United States). They also transport all automobile rail loads imported and exported through the Ports of Los Angeles, Long Beach, San Diego, and Port Hueneme. In addition, the lines transport carload traffic and connect to branch lines in the Basin.

The BNSF Transcon in the Basin runs from San Bernardino to downtown Los Angeles, where it connects to the triple track Alameda Corridor and thus to the POLA and POLB. UP's Los Angeles Subdivision runs from West Riverside to downtown Los Angeles, and the Alhambra Subdivision runs from Colton to downtown Los Angeles. Both lines connect to the Alameda Corridor. They also connect to the north-south rail routes for UP, the Coast and the Santa Clarita Lines. Metrolink operates its 91 Line service, its Inland Empire Orange County Line service, and its Orange County Line service on the BNSF Transcon. Amtrak's long distance Southwest Chief and the Amtrak Pacific Surfliners also operate on the Transcon.

Wilbur Smith Associates
ENGINEERS
PLANNERS
ECONOMISTS

Figure 9
BNSF TRANSCON WEST OF SAN BERNARDINO, UP LOS ANGELES SUBDIVISION, AND UP ALHAMBRA LINES
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As noted, the Los Angeles Subdivision connects to Transcon at West Riverside and the UP Las Vegas mainline at Daggett. Between West Riverside and Daggett, UP operates over the BNSF Transcon via trackage rights. The Alhambra Subdivision connects to the UP Las Vegas mainline via a combination of UP and BNSF trackage between Colton and Daggett. The Los Angeles Subdivision connects to the Sunset Corridor via the Transcon between West Riverside and Colton. The Alhambra Subdivision connects to the Sunset Corridor at West Colton and to the Colton Cutoff at West Colton. Amtrak's Sunset Limited runs on the Alhambra Subdivision, and Metrolink's Riverside Line service runs on the Los Angeles Subdivision.

UP's Los Angeles Basin operating plan is to route eastbound trains on the Los Angeles Subdivision and westbound trains on the Alhambra Subdivision.[18] Thus, trains from Los Angeles bound for the Sunset Corridor travel over the Los Angeles Subdivision to West Riverside, over the BNSF Transcon from West Riverside to Colton, and on to the Sunset Corridor at Colton. The UP Sunset Corridor and the BNSF Transcon cross each other at grade in Colton. There is a connection between the two lines there. This connection track makes the UP's strategy of directional flow of trains operationally feasible. UP's Alhambra Subdivision becomes the Sunset Corridor at Colton. The majority of rail traffic on the lines mentioned above comes from and goes to points outside the MCGMAP study area.

UP's north-south routes include the Coast Line and the Santa Clarita Line. Amtrak's long distance Coast Starlight, Amtrak Pacific Surfliners, and Metrolink's Ventura County Line service operate on the Coast Line. Metrolink's Antelope Valley Line operates on the Santa Clarita Line.

Publicly Owned Track

In the early 1990s, public agencies acquired track of both the former Southern Pacific Transportation Company (SP) and the Atchison, Topeka, and Santa Fe Railway (ATSF) as a prelude to the initiation of Metrolink commuter rail service. Much of this track is used by the Metrolink commuter rail service, operated by SCRRA. Sixty-four percent of Metrolink trains run on these lines, with the remainder using BNSF and UP lines. Metrolink dispatches about 100 freight trains daily using these lines.

These publicly owned lines include the Santa Clarita and Coast Lines. They also include lines running from Fullerton and Atwood to Orange, and thence to San Diego. These were former ATSF lines, now owned by Orange County Transportation Authority (OCTA). Metrolink's San Bernardino Line runs on a combination of former SP and ATSF lines now owned by Metro and the San Bernardino Associated Governments. Approximately five freight trains run on between the BNSF Transcon and San Diego today.

Another publicly owned track is the Alameda Corridor running from near downtown Los Angeles to the San Pedro Bay Port area. This line handles approximately 54 trains per day now.

Short Lines

There are four primary short line operators in the study area. A short line is a small railroad, generally connecting to the mainlines. Some are owned by public agencies, some controlled by large railroads like UP and BNSF, and others are independently owned and operated. All interchange traffic with the major railroads.

The largest short line in terms of miles, carload volume, and range of activity (addressed here) is Pacific Harbor Line (PHL), serving the POLA and POLB. The PHL franchise includes the distribution of all carload traffic in the Harbor District (track owned by the two ports) on behalf of UP and BNSF. PHL is paid a loaded per-car rate for this service. PHL also dispatches and maintains the Harbor District tracks. This expense is billed to the UP and BNSF proportional to their share of traffic. PHL also offers services to satisfy the on-dock switching needs of the railroads and marine terminals.

The Ventura County Railroad (VCRR) is located in Oxnard and connects Port Hueneme to UP at Oxnard. The track and rail property is owned, dispatched, and maintained by the port. VCRR moves automobile traffic between Port Hueneme and the UP at Oxnard.

The Arizona and California Railroad (ARZC) connects to the BNSF Transcon at Cadiz, California, and at Parker, Arizona, on the BNSF Phoenix Line. ARZC bridges traffic from Cadiz to Parker for BNSF. This traffic originates on BNSF in California and the Pacific Northwest. ARZC also operates a branch line into Blythe, California. The track over which the short line operates is leased from BNSF, but is maintained and dispatched by ARZC.

The Los Angeles Junction Railway (LAJ) operates in the cities of Commerce and Vernon. LAJ is a wholly owned subsidiary of BNSF. UP has access to all customers through LAJ. The track and property are owned by BNSF, but are maintained and dispatched by LAJ.

The Ventura County Transportation Commission (VCTC) is investigating the feasibility of reestablishing the eastern connection of the Santa Paula Branch Line to the SCRRA-owned Santa Clarita Line in Santa Clarita. VCTC purchased the Ventura County portion of the Santa Paula Branch in the mid 1990s from the former Southern Pacific Railroad. At the time of the purchase, the line terminated in Piru; the portion between Piru and Santa Clarita had been abandoned years earlier. Shippers on the Santa Paula Branch today are served by UP. Traffic consists of lumber and paper shipments. Service is three times per week. Freight service terminates in Santa Paula. The Fillmore & Western Railway operates the dinner train/tourist train service between Santa Paula, Fillmore, and Piru.

The VCTC study will look at the potential for using a reconnected Santa Paula Branch Line for both commuter service to Los Angeles and for freight rail traffic emanating from Port Hueneme. Port Hueneme-related freight traffic conceivably could use the line to reach the UP at Palmdale for running north to the Central Valley, the BNSF at Mojave for running north to the Central Valley as well as east to Midwestern destinations, and the UP Colton Cutoff at Palmdale for running east to the Gulf and Midwest. Also, UP could conceivably route Coast Line trains via this route. Amtrak could route Pacific Surfliners via this route as well.

Important aspects of short line operation are:

- PHL and ARZC are examples of UP and BNSF outsourcing work. The large railroads facilitated and structured the formation of job-specific entities to perform labor-intensive services. The creation of these short lines was not deemed to have a potentially adverse effect on competitive advantages.
- VCRR and LAJ were formed and operated by entrepreneurs outside the big rail companies. LAJ was subsequently purchased by BNSF, while VCRR has remained independent.
- The revenue of PHL and ARZC is based on a per-car allowance negotiated with UP and BNSF. VCRR and LAJ have rate making authority independent of BNSF and UP.
- All of the short lines are essentially switching carriers, performing work of high labor-intensity. They provide a specialty service to the large railroads by concentrating their resources on intra-city (and to a lesser degree intra-region) operating issues.
- None of the short lines has operating scopes beyond defined boundaries. For example, PHL only has authority to operate at the south end of the Alameda Corridor, and then only to facilitate an interchange of rail traffic to UP and BNSF.
- The short lines have no regional influence on goods movement issues and should be viewed as outsourcing entities of UP and BNSF.

BNSF and UP Train Volume

The markets which are served by BNSF and UP generate significant train volumes. The average east-west daily train count on BNSF during the late week period (Wednesday-Friday, the busiest days) is set forth in Table 4. Passenger trains include Metrolink commuter trains, Pacific Surfliner trains, and Amtrak long distance trains. Most of the passenger trains on BNSF Los Angeles Basin lines travel between Los Angeles and Fullerton.

Table 4
Average Daily Trains on BNSF East-West Mainline between Hobart Yard and Fullerton
Wednesday-Friday

Transcon	2003	2004	2005 (thru July)
Freight	47	49	48
Passenger	52	52	57
TOTAL	99	101	105

Sources: BNSF, 2005; and Metrolink, 2006

Table 5 shows the average east-west daily train counts on UP (Wednesday-Friday, the busiest days) at West Riverside on the Los Angeles Subdivision and South Fontana on the Alhambra Subdivision:

Table 5
Average Daily Trains on UP East-West Mainlines at Fontana on the Alhambra Subdivision and at West Riverside on the Los Angeles Subdivision
Wednesday-Friday

Los Angeles Subdivision	2003	2004	2005 (thru July)
Freight	22	24	23
Passenger	12	12	12
Total	34	36	35
Alhambra Subdivision	**2003**	**2004**	**2005 (thru July)**
Freight	41	44	43
Passenger	1	1	1
Total	42	45	44
Grand Total	76	81	79

Source: UP, 2005

As previously noted, UP operates trains directionally by using the Los Angeles Subdivision for eastbound trains and the Alhambra Subdivision for westbound trains. However, the asymmetry in the numbers above seems to contradict that operating strategy. The location of UP's carload classification yard at West Colton accounts for this difference; that is, westbound and eastbound trains operating in the Basin to and from the yard can only use the Alhambra Subdivision.

Rail Border Crossings

There are two rail border crossings in Southern California. One crossing is between San Ysidro and Tijuana, and the other is between Calexico and Mexicali. The former is part of a rail line originally built in the early part of the 20th century. The route stretches west from Plaster City and a connection with the UP there, then along and finally across the U.S./Mexican border to Tecate in Baja California, then to Tijuana, across the border again at San Ysidro, and then north to San Diego. The route goes through the scenic Carrizo Gorge in Baja California.

The portion of the rail line in Mexico is owned by the federal government. Under contract to the State of Baja California, Carrizo Gorge Railway (CZRY) operates a line between Tecate and Tijuana through its Mexican company, Ferrocarriles Peninsulares del Noroeste (FPN). Between Tijuana/San Ysidro and San Diego, the line is owned by San Diego Metropolitan Transit System (MTS). The operator is the San Diego and Imperial Valley Railroad (SDIY), a subsidiary of RailAmerica, Inc. Comparatively light freight traffic (about 500 total carloads per month) moves on the line between Tecate, Tijuana, and San Diego. Freight rail traffic between Tijuana and San

Diego moves during the late night and early morning period, on track that during most of the day is used by the San Diego Trolley light rail system. The traffic is interchanged with BNSF in downtown San Diego.

East of Tecate, on the U.S. side to Plaster City, the line is owned by MTS as well. This trackage is the so-called Desert Line. CZRY has operating rights over this line to Plaster City, and on the UP's El Centro Subdivision between Plaster City and Seeley; UP's El Centro Subdivision runs from Plaster City to El Centro and a connection with UP's Calexico Subdivision. CZRY receives a light traffic volume (about 30-50 carloads a month) from UP at Seeley for furtherance to Tecate.

There is a small amount of through traffic over the entire routing from Imperial County to San Diego. About 10 carloads a month of the traffic from the UP at Seeley to the CZRY ultimately reach downtown San Diego. This traffic is inbound to San Diego.

The crossing between Calexico in California and Mexicali in Baja California sees a higher traffic volume (about 160 cars per day, six days a week). On the U.S. side, the track belongs to UP. This track is part of the UP's Calexico Subdivision, which runs north to a junction with the UP's Sunset Corridor at Niland. On the Mexican side, the track belongs to the government, with trains operated by Ferrocarril Mexicano (Ferro-Mex).

Rail Processing Facilities

There are six primary types of rail traffic processing facilities found in the study area:

- On-dock Intermodal Facilities
- Near-dock Intermodal Facilities
- Off-dock Intermodal Facilities
- Carload Facilities and Support Yards
- Automobile Distribution Centers
- Bulk Transfer Facilities

The following section is a discussion of each of these types of facilities. All six types of rail traffic processing facilities are considered to be commercial because they generate railroad revenue. The major railroads and rail processing facilities in the MCGMAP study area are shown in Figure 10.

Figure 10
MAJOR RAIL FACILITIES IN THE MCGMAP STUDY AREA

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On-Dock Intermodal Facilities

There are nine on-dock intermodal facilities in the San Pedro Bay port area. On-dock facilities are located on container handling marine terminals, thus the term "on-dock." They are leased to terminal operators. Four of these are situated in the POLA, and five are in the POLB. On-dock rail facilities are constrained by a lack of space around docks, more so than near-dock and off-dock rail facilities. As a result, on-dock working track cannot be as long as the off-dock counterparts. The role of storage tracks in the proximity of on-dock loading facilities is to provide support and to increase turnover, and to provide a nearby place to store trains awaiting a working track at an on-dock facility. The POLB on-dock facilities generally lack outside storage tracks to support on-dock loading of rail cars. On the other hand, the POLA on-dock facilities have outside storage tracks. Over the last few years, on-dock rail lifts have significantly increased. In 2001, 15% of the total San Pedro Bay ports' throughput was handled on-dock. In 2005, approximately 21% of the total two-port throughput was handled on-dock.

The master plan of the POLB is to construct larger terminals by joining smaller terminals together and building storage tracks to support those facilities. The plan also involves adding two 8,000-foot arrival/departure tracks. Long-unit trains exacerbate the storage problem because arriving and departing trains often have to be stored temporarily before they can either enter a terminal or leave the port. The plan also includes expansion of the Pier B Street railroad yard to include new storage tracks and a small two-track intermodal container transfer facility.

Two major port tenants do not have on-dock intermodal facilities. They are Transpacific Container Service Corporation (TRAPAC) in the POLA and California United Terminals (CUT) in the POLB. All rail traffic generated by these terminals requires a truck dray to a railroad-operated off-dock or near-dock intermodal facility. The POLA plans to build an on-dock rail facility at TRAPAC by 2010.

Near-Dock Intermodal Facilities

UP's Intermodal Container Transfer Facility (ICTF) in Los Angeles (on the western border of Long Beach) is the only near-dock intermodal facility in the study area. In 2005, 650,000 intermodal container lifts were handled at ICTF.[19] ICTF also processes a small number of containers in which domestically manufactured products are transported. These units are international marine containers that the owner has marketed in the East for return haul after the box has been emptied of imported cargo. Approximately 40% of the westbound containers processed at the ports' near-dock facilities contain exports or goods from the Los Angeles basin markets.[20] The line haul revenue the ocean carrier receives from a shipper using this service offsets the cost of returning empty containers to the West Coast. Approximately 55% of the containers offloaded at POLA and POLB and loaded onto railcars make their return empty.[21] Near-dock facilities are also constrained by space, although not to the extent of on-dock facilities; as the majority of near-dock facilities are surrounded by development and any expansion requires a lengthy permitting and approval process.

Off-Dock Intermodal Facilities - BNSF

The Hobart Yard is situated in the City of Commerce, not far from downtown Los Angeles. The traffic split is 60 percent international (having a prior or subsequent move by ocean carrier) and 40 percent domestic. In 2005, Hobart had an intermodal volume of 1,350,000 units.[22] A few years ago, it was thought that Hobart had a capacity of 1,000,000 units annually. Adopting new business practices has increased capacity substantially. For example, BNSF implemented metered access (a form of appointment system) and reduced free storage time with a steep penalty if exceeded. It began stacking containers, a practice that is more expensive than a wheeled operation. BNSF is also limiting the storage of chassis at Hobart. The facility is the largest intermodal operation in the U.S. as measured by volume. The throughput per acre is more than 10,000 TEUs (Twenty Foot Equivalent Units) annually. A 20-foot container is one TEU, while one 40-foot container is two TEUs. For purposes of comparison, POLA and POLB throughput is about 4,700 TEUs per acre.[23]

The volume of BNSF's San Bernardino intermodal facility is 100 percent domestic, in that trailers and containers handled at the facility move only between points in North America.[24] The distance from the port area in part accounts for this. Ocean carriers can avoid a lengthy and costly truck haul of intermodal containers to San Bernardino by using on-dock or near-dock facilities. However, the earlier cited ACTA study estimated that 60 percent of all eastbound domestic containers transported from San Bernardino were filled with port cargo. This cargo had been taken out of the standard marine container and transloaded or warehoused before being transported to the San Bernardino facility in a domestic trailer or container.

Off-Dock Intermodal Facilities - UP

UP's East L.A. facility is situated in the Cities of Commerce and Montebello. It handles 450,000 intermodal lifts (container units)/year, 45 percent of which are international and 55 percent domestic.[25] Even though UP has a near-dock facility, East L.A. is a major processor of international containers. This is because East L.A. combines domestic and international containers into trains sized for small intermodal markets such as Salt Lake City and Denver (as compared to large intermodal markets like Chicago). UP recently changed its operation by processing more international containers at ICTF. Furthermore, UP states that it intends to move all international containers from East L.A. to ICTF by the end of 2006.

The Los Angeles Transportation Center (LATC) handles 250,000 container lifts per year, five percent international and 95 percent domestic.[26] This facility is UP's only intermodal facility in the study area that serves the Pacific Northwest with service to Portland and Seattle.

The City of Industry intermodal facility is situated within the City of Industry and is operated as a domestic container facility. Nearly 100 percent of the containers moving through this facility are domestic.[27] As at San Bernardino on BNSF, a high percentage of eastbound traffic originating at the City of Industry intermodal facility is transloaded international container traffic.

It is worth noting that UP has three off-dock intermodal facilities situated near each other: East L.A., LATC, and the City of Industry intermodal facility. This is because UP inherited two from the former Southern Pacific (SP) Railroad through its 1996 merger with that carrier. The SP owned

LATC and the City of Industry facilities. BNSF has better coverage of the L.A. Basin, as its intermodal facilities - Hobart Yard and San Bernardino - are situated 60 miles apart.

A summary of intermodal rail volumes associated with the San Pedro Bay ports is presented in Table 6. The POLA and POLB generated a total of 3.2 million intermodal container lifts in 2005. An additional 1.8 million domestic container lifts occurred in the study area in 2005, based on the shares of international and domestic volumes reported for the off-dock and near-dock facilities. Therefore it is estimated that the study area generated five million intermodal container lifts in 2005.

Table 6
San Pedro Bay Ports Direct Intermodal Rail Volumes 2003-2005
(Marine Containers per Year)

Facility Type	2003	2004	2005
On-Dock			
BNSF	591,280	781,715	977,945
UP	456,299	534,870	652,527
Total On-Dock	1,047,579	1,316,585	1,630,472
As % of Total Throughput	15.9%	18.1%	20.7%
Off-Dock (includes ICTF)			
BNSF	760,237	774,336	781,980
UP	777,534	771,562	757,598
Total Off-Dock	1,537,771	1,545,898	1,539,578
As % of Total Throughput	23.4%	21.2%	19.5%
Total On- & Off-Dock [i]	2,585,350	2,862,483	3,170,050
As % of Total Throughput	39.3%	39.3%	40.2%
Total Port Throughput [ii]	**6,576,147**	**7,278,496**	**7,885,801**

Sources: BNSF Railway and UP Railroad for on-dock and off-dock volumes, Ports of Los Angeles and Long Beach for total port throughput.
Notes:
[i] Direct intermodal (excludes transload)
[ii] Total port container throughput calculated by dividing TEUs by 1.80 TEUs/container.

Carload Facilities and Support Yards

The regional carload classification yard of UP is situated at West Colton (Bloomington), and that of BNSF at Barstow. In addition to these large classification yards, there are numerous industrial support yards situated in the MCGMAP study area. From the classification and support yards, local freight trains move rail cars to and from shippers.

Automobile Distribution Centers

Railroad automobile distribution centers in the MCGMAP study area are situated at Mira Loma (served by UP), at San Bernardino (served by BNSF), and at POLA, POLB and Port Hueneme (served by UP at Oxnard and a connection to the Ventura County Railroad, discussed in a subsequent section).

Bulk Transfer Facilities

UP has a 28-acre plastic pellet and resin distribution center at Santa Fe Springs. UP also has dedicated, smaller distribution facilities scattered throughout the Los Angeles Basin. Chemicals, steel, and lumber are commonly distributed from these facilities, as are plastics and resins. Most of these facilities are single-user-based facilities, where a trucking company leases property and track from the railroad to facilitate carriage of lading from rail cars to end product users.

BNSF has similar bulk distribution facilities. For example, BNSF is working closely with Excell, a large national logistics company, to develop a bulk distribution center on 100 acres of property in Fontana. This facility will distribute all bulk product types. As with UP, BNSF has numerous smaller, bulk commodity-oriented distribution facilities throughout the Los Angeles Basin situated on property owned or controlled by the railroad.

2.3 ROADWAYS

This section presents the existing conditions of the roadway facilities in the study area. It provides an inventory of the roadway system, summarizes traffic volumes, travel patterns, and time-of-day distribution for truck traffic, and examines the impacts of port traffic on the highways. Issues and constraints related to the existing conditions will be presented in Section 4.

According to SCAG's 2004 Regional Transportation Plan (RTP), the MCGMAP study area has more than 9,000 lane miles of freeways and more than 42,000 lane miles of arterials.[28] This network of public highways and arterials carries 99 percent of all vehicle trips, including bus, automobile, and truck trips; the remaining one percent of trips occurs on private facilities. Table 7 presents lane miles by facility type within the study area in the year 2000.

Currently, there are approximately 662 lane miles of the high occupancy vehicle (HOV) system in the study area. Most of the HOV system is open to vehicles with two or more occupants over the 24-hour day. The exceptions are the HOV lanes on I-10 (the El Monte Busway), which requires a vehicle occupancy of three or more persons during peak periods.

Table 7
MCGMAP Study Area Lane Miles by Facility Type, Year 2000

County	Mixed Flow	HOV	Major Arterial	Minor Arterials	Collector
Los Angeles	4265	370	8390	8498	2245
Orange	1435	202	3235	2943	303
Riverside	1320	38	1225	2754	2648
San Bernardino	1135	52	1797	3556	2765
Ventura	514	0	927	953	219
Regionwide	8669	662	15574	18704	8180

Source: Southern California Association of Governments (SCAG) Regional Transportation Plan¸2004, Appendix D, Highway and Arterial.

This amounts to over 54 million vehicle trips per day on the regional highway and arterial system. This system includes critical access routes to the ports, airports, warehouse and distribution centers, and rail intermodal facilities. The 2004 RTP reported that in the year 2000, total daily delay from congestion, for both personal travel and goods movement, was estimated at approximately 2.2 million person-hours throughout the study area. The impact of delay on the freight industry is significant, and can increase the hourly cost of carrying goods by 50 percent to 250 percent, from a base value of $25 to $200 per hour, depending on the commodity.[29]

Inventory of Systems

The study area's roadway system can be divided into three primary components: freeways, arterials, and local roads. The purpose of each of those components, in terms of goods movement, is summarized below:

- **Freeways** link the cities throughout California to the adjoining states and nations. For the purposes of this report, the term freeway refers to both Interstate Highways and State Highways. The freeways in the study area link the freight gateways (ports, intermodal facilities, etc.) to markets throughout the United States, Canada, and Mexico. Freeways provide the infrastructure to service the short-, medium-, and long-haul (or line-haul) portions of truck trips.
- **Arterials** serve as the link between freeways and local roads. The arterials in the study area provide the necessary connectivity for both personal and commercial transportation. According to the 2004 RTP, these facilities often act as alternatives to freeways. This is especially true in the case of short-haul trips between adjacent cities in the study area, as well as between major goods movement activity centers such as ports' intermodal yards and warehousing areas.
- **Local Roads** provide the final link between the freight gateways and the local markets. Local roads are commonly utilized to travel from the arterials to the warehouse and distribution facilities. The impacts of truck traffic can sometimes appear greater on local facilities due to limited size and capacity. The majority of truck trips on local roads are of

short length, representing the first or last stage in goods movement between distribution centers, markets, or both. Local roads could be used as detours when freeways fail due to non-recurrent congestion. For example, when I-710 shuts down, Long Beach Boulevard and Alameda Street (north-south arterials parallel to I-710) serve as alternate routes, and Washington Boulevard serves as a detour option for I-10.

Figure 11 shows the existing state highway system within the study area.

Figure 11
EXISTING HIGHWAY SYSTEM WITHIN THE MCGMAP STUDY AREA
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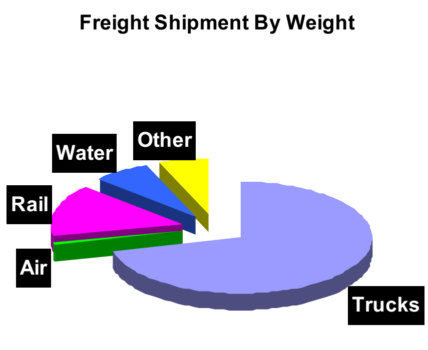
Truck Traffic and Goods Movement

From a national standpoint, most heavy truck mileage is generated in the carriage of freight. Only about 10 percent of truck miles are generated for other reasons such as carrying household goods, garbage, and craftsmen's equipment. Truck traffic is concentrated on major routes connecting population centers, ports, border crossings, and other major hubs of activity.[30]

Trucks carry almost two-thirds of goods from Mexico and Canada to the United States. According to the Federal Highway Administration (FHWA), in 1998 trucks moved 71 percent of total (international and domestic) tonnage and 80 percent of the total (international and domestic) value of U.S. shipments.

Figure 12
Nationwide Percentages of Truck Freight Shipments by Weight and Value

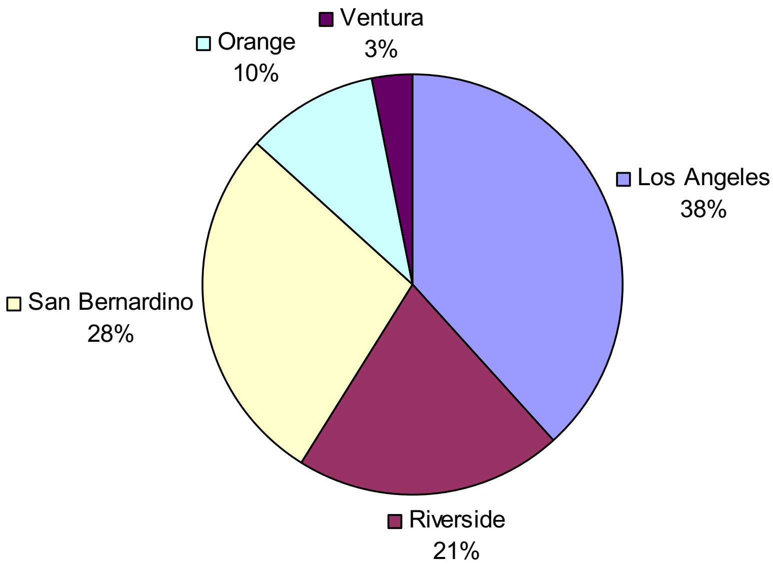


Source: Federal Highway Administration (FHWA), Freight Facts and Figures, 2004

Existing Volumes throughout the Study Area

The amount of truck travel varies by county in the study area. Figure 13 shows the distribution of truck travel by county, measured in vehicle miles of travel (VMT), as a percentage of total truck travel on the state highway system within the study area for 2003. Los Angeles County carried the highest percentage of truck travel at 38 percent, with San Bernardino and Riverside Counties carrying 28 percent and 21 percent, respectively. Together these three counties handled approximately 87 percent of all truck travel within the study area in 2003. The data presented on this chart are a function of the available lane miles of highway facilities available and the volume of trucks using those facilities. It clearly shows that a majority of the truck travel occurring within the study area is in Los Angeles, San Bernardino, and Riverside Counties.

Figure 13
2003 Percentage of Truck Vehicle Miles of Travel (VMT) on the State Highway System within the MCGMAP Study Area



Source: "Truck Miles of Travel: California State Highway System 1988-2003," California Department of Transportation (Caltrans) 2005

Further evaluation of truck volume data for the study area reveals that in addition to varying distribution of truck travel among counties, there is a variance in truck travel among the highway corridors in the study area. Tables 8a, 8b, and 8c show a summary of peak hour (morning and evening) and daily total traffic volumes and truck traffic volumes for the state highway segments of high, moderate, and low congestion within the study area. Congestion is determined based on average speed data, and categorized from high (21 mph to 34 mph), to moderate (35 mph to 44 mph) to low congestion (45 mph to 54 mph).

Table 8a
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of High Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
I-5	ORG	30.0	SR-55 to SR-57	S	12833	656	31.1	5%	N	10703	283	31.5	3%	344000	22016	6.4
I-5	ORG	33.1	SR-57 to LA County Line	S	11427	252	27.9	2%						260000	18200	7
I-10	LA	6.7	I-405 to I-110	W	8732	282	33.9	3%						264000	10639	4.03
I-10	LA	24.3	I-710 to I-605	W	7462	282	32	4%						22500	13658	6.07
I-110	LA	20.7	I-105 to I-10	N	8166	372	28.3	5%						292000	15388	5.27
I-215	RIV	38.3	I-10 to I-259						N	5206	393	33.3	8%	185000	20165	10.9
I-405	ORG	28.3	I-5 to SR-133	N	10958	288	21.6	3%						225000	9608	4.27
I-405	ORG	19.2	Beach Blvd to LA County Line	S	9294	363	30.2	4%						287000	9586	3.34
I-405	LA	14.9	I-110 to I-91	N	9178	309	26.2	3%						250000	11575	4.63
I-405	LA	44.3	US-101 to End	S	9503	309	26.2	3%	N	9311	209	30.2	2%	227000	8694	3.83
I-605	LA	11.0	SR-91 to I-105						N	7114	450	34.2	6%	247000	11436	4.63
I-605	LA	11.0	I-105 to I-5						N	7114	569	27.1	8%	267000	37700	14.12
I-605	LA	11.0	I-5 to SR-60	S	8377	889	33.1	11%	N	7114	814	33.6	11%	254000	35865	14.12
I-710	LA	25.2	I-5 to SR-60						S	4896	478	28.4	10%	133000	11385	8.56
SR-55	ORG	8.5	I-405 to I-5						N	3903	172	32.9	4%	257000	15163	5.9
SR-55	ORG	8.5	I-5 to SR-22	S	15037	565	24	4%						257000	15163	5.9
SR-57	ORG	15.6	I-5 / SR-22 to SR-91	S	9213	633	26.9	7%	N	12220	252	34.3	2%	300000	20400	6.8

Table 8a
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of High Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
SR-57	ORG	15.6	SR-91 to LA County Line	S	9213	466	28	5%	N	12220	280	31.5	2%	300000	20400	6.8
SR-60	LA	2.2	End to I-710	W	9013	247	28.5	3%						210000	10164	4.84
SR-60	LA	23.6	I-605 to SR-71						E	10955	424	32.6	4%	345000	27980	8.11
SR-91	LA	17.6	I-710 to I-605	W	9255	341	31.9	4%						273000	25280	9.26
SR-91	ORG	10.1	SR-241 to Riverside County Line						E	10261	241	23.5	2%	284000	13206	4.65
SR-91	RIV	6.4	Riverside County Line to I-15	W	7954	364	30.5	5%	E	8091	403	34.3	5%	250000	17000	6.8
US-101	LA	12.4	I-110 to SR-170	S	9581	263	32.1	3%	N	9766	172	23.6	2%	292000	7738	2.65
US-101	LA	19.9	SR-170 to I-405	S	10487	274	33.7	3%						216000	8510	3.94
SR-134	LA	12.1	SR-170 to I-5						E	8751	142	33.9	2%	213000	5708	2.68

Sources: (a) Caltrans, Traffic and Vehicle Data Systems Unit, 2004 Truck; (b) Caltrans, 2005 Peak Hour Volume Data; (c) Southern California Association of Governments (SCAG), 2005 PeMS Database v. 6.3

Table 8b
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of Moderate Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
I-5	ORG	30.0	SR-133 to SR-55	N	12251	469	43.5	4%						344000	22016	6.4

Table 8b
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of Moderate Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
I-5	ORG	33.1	SR-55 to SR-57	S	12833	839	40.5	7%	N	10703	383	42.5	4%	344000	22016	6.4
I-5	LA	15.33	I-605 to I-710	N	8818	414	44.8	5%	S	8481	452	42.3	5%	235000	20657	8.79
I-5	LA	15.33	I-710 to SR-60						S	8481	313	38.7	4%	264000	20117	7.62
I-5	LA	21.3	SR-60 to SR-143	S	9114	379	40.5	4%	N	9964	347	41.6	3%	291000	17984	6.18
I-5	LA	33.98	SR-143 to SR-118	S	7725	530	38.5	7%						192000	16397	8.54
I-10	LA	6.74	I-405 to I-110	W	8732	338	36.6	4%	E	9051	161	38.8	2%	264000	10639	4.03
I-10	LA	24.32	I-710 to I-605	W	7462	277	43.1	4%	E	6683	221	35.9	3%	225000	13658	6.07
I-10	LA	40.84	I-605 to SR-71	E	7389	362	40.9	5%						211000	16901	8.01
I-15	SBD	5.973	I-210 to I-215	S	8010	444	39.6	6%						168000	17304	10.3
I-105	LA	2.6	I-405 to I-110						E	8499	332	40.2	4%	197000	11209	5.69
I-105	LA	8.45	I-110 to I-710	W	8523	260	35.8	3%	E	7823	195	43.2	2%	207000	17367	8.39
I-105	LA	17	I-605 to End	W	7219	332	44	5%	E	6554	261	39.7	4%	196000	17346	8.85
I-110	LA	20	I-105 to I-10	N	8166	441	40.4	5%	S	9639	311	42.3	3%	292000	15388	5.27
I-110	LA	31.91	I-10 to End	S	1509	338	41.8	22%						46500	451	0.97
I-210	LA	23	SR-134 to I-605	W	4287	365	42.5	9%	E	4712	259	42.7	5%	140000	9478	6.77
I-210	LA	46	I-605 to SR-57	W	7795	383	38.2	5%	E	7107	272	43.7	4%	167000	6880	4.12
I-215	RIV	38	I-10 to I-259						N	5206	464	38.4	9%	185000	20165	10.9
I-405	ORG	6	I-5 to SR-133	N	10958	254	36	2%						225000	9608	4.27
I-405	ORG	16	SR-55 to Beach Blvd	S	9741	302	41.5	3%						276000	8280	3
I-405	ORG	19	Beach Blvd to LA County Line	S	9294	443	38.8	5%	S	8656	183	40.1	2%	287000	9586	3.34
I-405	LA	6.8	I-710 to I-110	N	11720	329	35.3	3%	S	10828	230	41.4	2%	290000	15805	5.45
I-405	LA	14.92	I-110 to SR-91	N	9178	371	40.2	4%						250000	11575	4.63
I-405	LA	28.3	SR-91 to I-105						S	8748	168	38.6	2%	294000	11878	4.04
I-405	LA	28.3	I-105 to I-10	N	10144	325	40.1	3%	S	8748	212	37.9	2%	294000	11878	4.04
I-405	LA	30.5	I-10 to US-101						N	10033	248	35.4	2%	288000	13018	4.52
I-405	LA	44.27	US-101 to End						N	9311	292	42.8	3%	227000	8694	3.83
I-605	LA	11	SR-91 to I-105	N	7658	491	40.2	6%	N	7114	568	44.3	8%	247000	11436	4.63
I-605	LA	11	I-105 to I-5	N	7658	493	38.4	6%	N	7114	322	37.9	5%	267000	37700	14.12
I-605	LA	11	I-5 to SR-60						N	7114	1026	38.6	14%	254000	35865	14.12
I-605	LA	22.92	SR-60 to I-10	S	6792	1001	38.9	15%	N	6053	774	41.2	13%	167000	19389	11.61
I-710	LA	19	I-105 to I-5	N	4418	956	43.7	22%						215000	36550	17
I-710	LA	25.21	I-5 to SR-60						N	5220	936	43.5	18%	133000	11385	8.56
SR-55	ORG	8.5	I-405 to I-5	S	15037	432	39.7	3%	S	14862	330	42.9	2%	240000	13920	5.8
SR-55	ORG	8	I-5 to SR-22	S	15037	722	36.2	5%						257000	15163	5.9
SR-55	ORG	8	SR-22 to end	S	15037	428	41.5	3%						257000	15163	5.9
SR-57	ORG	15.6	I-5 / SR-22 to SR-91	S	9213	809	43.6	9%	N	12220	484	40.7	4%	300000	20400	6.8
SR-57	ORG	20	SR-91 to LA County Line	S	9213	569	37.8	6%	N	12220	398	44.4	3%	300000	20400	6.8
SR-57	LA	3.1	LA County Line to I-10	S	7842	403	36.9	5%	N	7083	295	43.6	4%	199000	15741	7.91
SR-60	LA	2.22	End to I-710	W	9013	246	36.8	3%						210000	10164	4.84

Table 8b
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of Moderate Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
SR-60	LA	2.22	I-710 to I-605	E	5537	444	39.8	8%						210000	10164	4.84
SR-60	LA	23.556	I-605 to SR-71	E	4905	673	44.5	14%	E	10955	592	43.2	5%	345000	27980	8.11
SR-91	LA	2.08	End to I-710						E	2957	168	41.7	6%	65000	3062	4.71
SR-91	LA	17.57	I-710 to I-605	W	9393	410	35.10	4%	E	10171	423	43.2	4%	273000	25280	9.26
SR-91	LA	17.57	I-605 to LA County Line						W	10171	472	43.8	5%	273000	25280	9.26
SR-91	ORG	1.3	LA County Line to SR-57	E	8735	631	44.70	7%	W	7920	589	43.7	7%	235000	13607	5.79
SR-91	ORG	10.9	SR-241 to Riverside County Line						E	10261	342	37.4	3%	284000	13206	4.65
SR-91	RIV	6.36	Riverside County Line to I-15	W	7954	450	41.3	6%	E	8091	457	40.5	6%	250000	17000	6.8
US-101	LA	12.35	I-110 to SR-170	S	9581	219	36	2%	N	9766	209	40.2	2%	292000	7738	2.65
US-101	LA	12.4	SR-170 to SR-143	S	9581	324	40.6	3%	N	9766	186	42.6	2%	292000	7738	2.65
US-101	LA	19.99	SR-143 to I-405	S	10487	281	44.9	3%	N	10459	159	44.9	2%	247000	10275	4.16
SR-134	LA	12.09	SR-170 to I-5						E	8751	143	40	2%	213000	5708	2.68

Source: (a) Caltrans, The Traffic and Vehicle Data Systems Unit, 2004 Truck; (b) Caltrans, 2005 Peak Hour Volume Data; (c) SCAG, 2005 PeMS Database v. 6.3

Table 8c
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of Low Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
I-5	ORG	30	SR-133 to SR-55	N	12251	384	50.3	3%	N	10703	373	48.3	3%	344000	22016	6.4
I-5	ORG	30	SR-55 to SR-57						N	12862	544	51.4	4%	344000	22016	6.4
I-5	ORG	33.1	SR-57 to LA County Line	N	11427	322	47.4	3%	N	12713	109	46.5	1%	260000	18200	7
I-5	LA	15.33	LA County Line to I-605	N	8818	429	49.7	5%	S	8481	409	54.4	5%	235000	20657	8.79
I-5	LA	15.33	I-605 to I-710	N	8818	498	46.8	6%	S	8481	661	45.8	8%	234000	21060	9
I-5	LA	15.33	I-710 to SR-60	N	8818	479	46	5%	S	8481	553	47.7	7%	264000	20117	7.62
I-5	LA	21.3	SR-60 to SR-143	S	9114	539	49.4	6%	N	9964	584	52.5	6%	291000	17984	6.18

Table 8c
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of Low Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
I-5	LA	33.98	SR-143 to SR-118	S	7725	628	53.7	8%	N	5633	486	50.9	9%	192000	16397	8.54
I-5	LA	41	SR-118 to SR-14	N	3679	551	54.4	15%	N	5480	709	54.4	13%	136000	12036	8.85
I-10	LA	18.41	END to I-405						E	9051	67	50.3	1%	264000	10639	4.03
I-10	LA	6.7	I-405 to I-110	W	8732	204	53.5	2%	E	9051	221	53.5	2%	264000	10639	4.03
I-10	LA	6.7	I-5 to I-710	W	761	202	45.9	27%						223000	8028	3.6
I-10	LA	24.32	I-710 to I-605	W	7462	412	50	6%	E	6683	389	53.2	6%	225000	13658	6.07
I-10	LA	40.84	I-605 to SR-71	W	7389	410	51	6%	E	7824	369	50	5%	211000	16901	8.01
I-15	RIV	38.69	Ontario Ave to SR-91	N	6430	378	49.7	6%	N	6032	283	53.7	5%	178000	9986	5.61
I-15	RIV	51.47	SR-91 to SR-60	N	5981	394	47.4	7%	N	5392	468	53.5	9%	219000	17958	8.2
I-15	SBD	5.9	I-210 to I-215	N	3478	402	54	12%	N	7206	518	49	7%	168000	17304	10.3
I-105	LA	2.6	End to I-405	W	8728	336	50	4%	E	6868	236	54	3%	197000	11209	5.69
I-105	LA	4.75	I-405 to I-110	W	8943	278	49.8	3%	E	8499	243	51.3	3%	197000	11209	5.69
I-105	LA	8.45	I-110 to I-710	W	8523	369	53	4%	E	7823	273	45.2	3%	207000	17367	8.39
I-105	LA	17	I-710 to I-605	W	7219	417	52	6%	W	6554	308	48.2	5%	196000	17346	8.85
I-105	LA	17	I-605 to End	E	7219	398	45.5	6%	E	6554	460	45.9	7%	196000	17346	8.85
I-110	LA	20	I-105 to I-10	N	8166	465	46	6%	S	9639	249	53.5	3%	292000	15388	5.27
I-110	LA	31.91	I-10 to End	S	1509	481	50.9	32%	N	2328	292	53.2	13%	46500	451	0.97
I-210	LA	23	SR-134 to I-605	W	4287	432	47	10%	E	4712	362	50	8%	307000	16118	5.25
I-210	LA	46	I-605 to SR-57	W	7795	454	51.7	6%	E	7107	380	47.2	5%	167000	6880	4.12
I-215	RIV	35.76	Columbia Ave to I-10						N	4402	195	49.1	4%	108000	11016	10.2
I-405	ORG	6	I-5 to SR-133	N	10958	350	51	3%						225000	9608	4.27
I-405	ORG	6	SR-133 to SR-55						N	12130	208	50	2%	231001	13629	5.9
I-405	ORG	15.9	SR-55 to Beach Blvd	S	9741	387	51.5	4%	N	10345	214	53.8	2%	276000	8280	3
I-405	ORG	19.16	Beach Blvd to LA County Line	S	9294	349	54	4%	S	8656	248	50.7	3%	287000	9586	3.34
I-405	LA	47.6	LA County Line to I-710	S	6686	325	50.8	5%	N	5242	266	49.2	5%	142000	7995	5.63
I-405	LA	6.81	I-710 to I-110	N	11720	394	53.2	3%	S	10828	321	47	3%	290000	15805	5.45
I-405	LA	14.92	I-110 to SR-91	N	9178	440	50.2	5%	S	8928	251	45.5	3%	250000	11575	4.63
I-405	LA	28.3	SR-91 to I-105	N	10144	343	52	3%	S	8861	235	48.2	3%	294000	11878	4.04
I-405	LA	28.3	I-105 to I-10	N	10144	385	46.5	4%	N	9297	264	54.9	3%	294000	11878	4.04
I-405	LA	30.5	I-10 to US-101						N	10033	376	54.5	4%	288000	13018	4.52
I-405	LA	44.27	US-101 to End	S	9503	335	53.5	4%	N	9311	213	51.6	2%	227000	8694	3.83
I-605	LA	11	SR-91 to I-105	N	7658	582	53.4	8%	N	7114	330	50	5%	247000	11436	4.63
I-605	LA	11	I-105 to I-5	N	7658	608	52	8%						267000	37700	14.12
I-605	LA	11	I-5 to SR-60	S	8377	1142	49.4	14%	S	8594	595	53	7%	254000	35865	14.12
I-605	LA	22.92	SR-60 to I-10	S	6792	1054	50	16%	N	6053	977	52.8	16%	167000	19389	11.61
I-710	LA	14.4	I-405 to I-105	S	9912	839	54.8	8%	N	9032	721	47	8%	227000	38272	16.86
I-710	LA	19	I-105 to I-5	N	8078	848	50.8	10%	S	7893	1228	54.5	16%	215000	36550	17
I-710	LA	25.21	I-5 to SR-60	S	5605	729	46	13%	S	4896	668	50	25%	133000	11385	8.56
SR-55	ORG	2.77	SR-73 to I-405	N	4128	58	45.8	1%						54000	1944	3.6

Table 8c
MCGMAP Study Area Daily and Peak Period Truck and Vehicle Volumes
Year 2003 – Segments of Low Congestion

				AM Peak Hour					PM Peak Hour					Total ADT		
Route	County	Postmile (b)	Location	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck Percentage	Dir	Total Vehicle Volume (b)	Total Truck Volume (c)	Speed (c)	Truck percentage	Total ADT (a)	Total Truck (a)	Total Truck Percentage
SR-55	ORG	8.5	I-405 to I-5	S	15037	552	45.9	4%	S	14862	405	50	3%	240000	13920	5.8
SR-55	ORG	8.5	I-5 to SR-22	S	15037	500	50.2	3%	N	3903	225	46.5	6%	257000	15163	5.9
SR-55	ORG	8.5	SR-22 to end	S	15037	669	52.4	4%	N	3903	217	48.5	6%	257000	15163	5.9
SR-57	ORG	15.6	I-5 / SR-22 to SR-91	S	9213	802	53.1	9%	N	12220	228	54.5	2%	300000	20400	6.8
SR-57	ORG	15.6	SR-91 to LA County Line	S	7945	728	48.4	9%	N	7554	188	48.4	2%	300000	20400	6.8
SR-57	LA	3.1	LA County Line to I-10	S	7842	478	48.9	6%	N	7083	259	47	4%	199000	15741	7.91
SR-60	LA	2.22	End to I-710	W	9013	292	49.1	3%	E	4154	156	50.3	4%	210000	10164	4.84
SR-60	LA	10	I-710 to I-605	W	5537	553	47.3	10%	E	8501	303	47.4	4%	241000	16075	6.67
SR-60	LA	23.56	I-605 to SR-71	W	11870	699	54.6	6%	W	12142	640	53.9	5%	345000	27980	8.11
SR-60	LA	30.5	I-215 to End						W	2273	418	53	18%	44000	7172	16.3
SR-91	LA	2.08	End to I-710	W	2016	227	53.7	11%	E	2957	195	46.6	7%	65000	3062	4.71
SR-91	LA	17.57	I-710 to I-605	W	9255	409	46.60	4%	E	10171	352	50	3%	273000	25280	9.26
SR-91	LA	17.57	I-605 to LA County Line	E	9393	699	54.60	7%	W	10171	640	53.9	6%	273000	25280	9.26
SR-91	ORG	1.3	LA County Line to SR-57	E	8735	516	45.10	6%	E	8709	261	48.4	3%	235000	13607	5.79
SR-91	ORG		SR-57 to SR-241	W	10400	543	53.00		E	10261	214	47.5	2%	284000	13206	4.65
SR-91	ORG	10	SR-241 to Riverside County Line	W	10400	446	45.40	4%	E	10261	155	50	2%	284000	13206	4.65
SR-91	RIV	6.36	Riverside County Line to I-15	W	7954	547	51.2	7%	E	8091	534	53.7	7%	250000	17000	6.8
SR-91	RIV	7.45	I-15 to End	E	7381	306	53.9	4%	E	7903	363	54.6	5%	160000	8000	5
US-101	LA	12.35	I-110 to I-710	S	9581	312	48.8	3%	S	8580	338	54.5	4%	292000	7738	2.65
US-101	LA	12.35	SR-170 to SR-143	S	9581	341	54.7	4%	N	9766	217	47	2%	310000	8122	2.62
US-101	LA	19.99	SR-143 to I-405	S	10487	296	50.9	3%	S	10459	274	54	3%	212000	7929	3.74
SR-134	LA	12.09	SR-170 to I-5	W	6919	227	54.1	3%	W	7981	148	46.1	2%	213000	5708	2.68
SR-134	LA	12.09	I-5 to I-210	W	6919	226	49.1	3%						213000	5708	2.68

Source: (a) Caltrans, The Traffic and Vehicle Data Systems Unit, 2004 Truck; (b) Caltrans, 2005 Peak Hour Volume Data; (c) SCAG, 2005 PeMS Database v. 6.3

According to SCAG's Heavy Duty Truck Model, the estimated number of average daily truck trips on the roadway network in 2002 was 795,000, which equates to a total of 25,500,000 VMT.[31] SCAG's 2004 RTP states that almost all of the short-haul and a significant share of medium- and long-haul movement of goods occur by truck. Some examples of freeways with heavy truck volumes are:[32]

- In high congestion conditions, both I-710 and I-605 between I-5 and SR-60 in Los Angeles County carry more than 35,000 trucks, representing 14 percent of total daily traffic.
- I-605 between I-5 and SR-60 in Los Angeles County, with 11 percent truck traffic, represents the highest truck percentage in the both AM and PM peak hour at high congestion.
- I-710 southbound between I-5 and SR-60 in Los Angeles County, with 10 percent truck traffic, represents the second highest truck percentage in the PM peak hour under high congestion conditions.
- I-710 northbound between I-105 and I-5 in Los Angeles County, with 22 percent truck traffic, represents the highest truck percentage in AM peak hour under medium congestion conditions.
- I-10 westbound between I-5 and I-710 in Los Angeles County, with 27 percent truck traffic, represents a medium truck percentage in AM peak hour under low congestion conditions.

Additionally, the Subregional Freight Movement Truck Access Study of 2004 presented the following findings specifically related to truck volumes during the two-hour midday period carrying the highest volumes of trucks:[33]

- The heaviest one-way north-south truck volume is 1,918 trucks on I-15 northbound between I-10 and SR-60, with the second highest (1,778) southbound on the same segment.
- The heaviest one-way truck volume on any of the east-west freeways is 2,265 trucks eastbound on SR-60 approaching I-15, with the second heaviest (1,923) on the westbound SR-60 approach to I-15.
- The heaviest truck volume for a connector ramp is 910 trucks from southbound I-15 to westbound SR-60, with the second highest being 869 trucks on the corresponding reverse movement from eastbound SR-60 to northbound I-15.
- The second set of highest connector ramp truck volumes are 670 and 602 trucks, from northbound I-15 to eastbound I-10 and the reverse, from westbound I-10 to southbound I-15, respectively.

Truck Lanes

Dedicated truck lanes, along with truck climbing lanes, offer the potential to keep goods moving efficiently through the study area while mitigating congestion for passenger vehicles, improving safety, and lowering overall emissions. There is one existing set of truck lanes in the study area, located on northbound and southbound I-5 in Los Angeles County at the State Route 14 split. The purpose of these truck lanes is to separate slower-moving trucks from the faster general traffic on the grade. After constructing the new I-5 alignment, the original alignment was used for the truck-only lanes. This truck-only facility has been in place for about 30 years.[34]

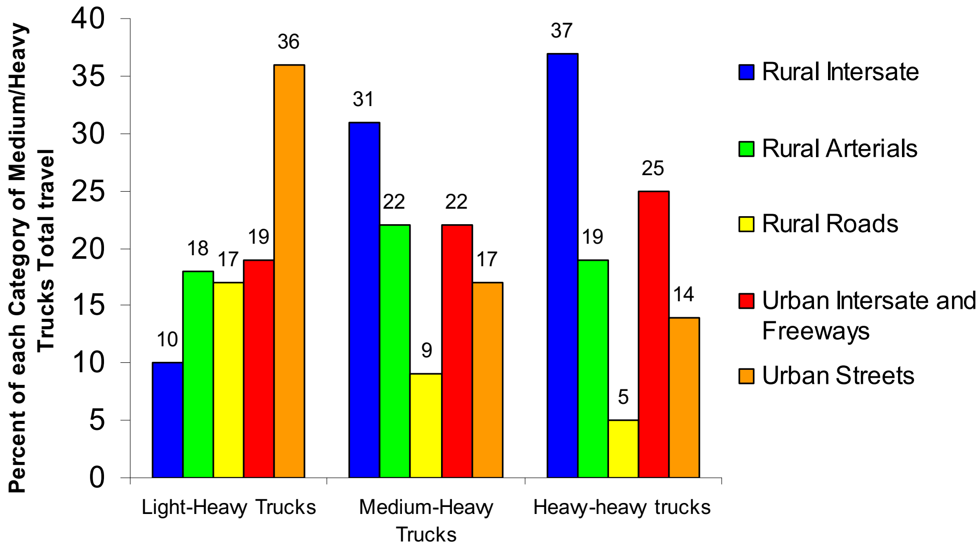
There is also a climbing lane on I-15. Additional climbing lanes are planned on SR-57 between Brea/Fullerton and the county line, and on SR-60 (in Riverside County).

Truck Activity by Truck Size

The most common single-unit trucks or light-heavy duty trucks (10,000 pounds or more) in the commercial fleet with three or more axles are dump trucks. They have from 2 to 4 axles. They are typically used in local and intrastate, short-haul operations. The most common commodities that they haul are construction materials, gravel, ready-mix cement, grain, milk, petroleum products, and garbage or waste. The six-axle trucks or heavy-heavy duty trucks (51,000-pound limit) are used for transportation of international containers loaded to the International Standards Organization (ISO) limit. They are used extensively for long and short hauls in all urban and rural areas to carry and distribute all types of materials, commodities, and goods.[35]

Figure 14 shows the travel distribution patterns of the three major subgroups of heavy duty trucks (light-, medium-, and heavy-heavy duty trucks). Heavy-heavy trucks accumulate 62 percent of their mileage on Interstates and similar roads, compared to 53 percent for medium-heavy trucks. On the other hand, light-heavy trucks accumulate 53 percent of their mileage on urban streets and rural roads, compared to 19 percent for heavy-heavy trucks and 26 percent for medium-heavy trucks. Therefore, the crash history for medium-heavy trucks is more heavily weighted and influenced by the greater risk exposure they experience on non-Interstate roads, compared to that of heavy-heavy trucks.

Figure 14
Percent of Trucks by Type and Facility Type



Source: Comprehensive Truck Size and Weight (CTS&W) Study, Volume 3, Chapter 8, U.S. Department of Transportation, August 2000

Table 9 presents a summary of daily truck VMT by truck size in the MCGMAP study area in the Year 2003. While Los Angeles County and Orange County have the highest light-heavy and medium-heavy truck VMT, San Bernardino and Riverside County carry the highest heavy-heavy truck VMT.

Table 9

2003 DAILY TRUCK AND TOTAL VEHICLE MILES OF TRAVEL BY DISTRICT AND COUNTY					
	District	Light -Heavy Trucks 2-axle	Medium Heavy Trucks 3 and 4 axles	Heavy-heavy Trucks multi-axle	Total
Los Angeles	7	2,564,937	998,559	3,433,882	6,997,378
Orange County	12	912,249	289,696	664,822	1,866,767
Riverside	8	1,167,186	389,918	2,202,485	3,759,589
San Bernardino	8	1,343,422	426,252	3,270,318	5,039,992
Ventura	7	270,384	105,797	193,433	569,614

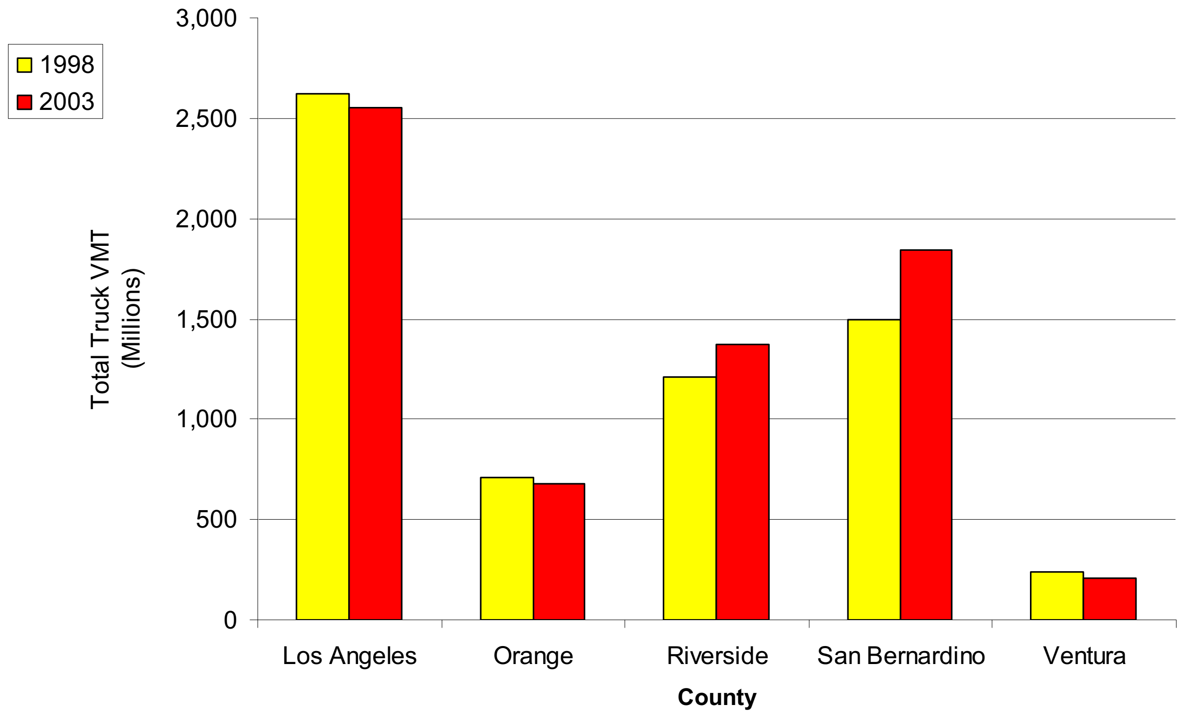
Source: Truck Miles of Travel: California State Highway System 1988-2003, Caltrans, 2005.

Historical Growth Trends for Truck Travel

Truck travel as measured in terms of VMT has grown in the study area. Total truck VMT grew from 5,610,532,550 in 1998 to 6,847,583,000 in 2003, an increase of 19 percent. Furthermore, the growth in truck VMT varied by county.[36] Figure 15 shows the change in miles of truck travel on the state highway system throughout the study area from 1998 to 2003. Truck VMT has increased substantially in Riverside and San Bernardino Counties, while experiencing a minor decrease in

Los Angeles, Ventura, and Orange Counties. The VMT for truck travel in Los Angeles County remains the highest in the study area.

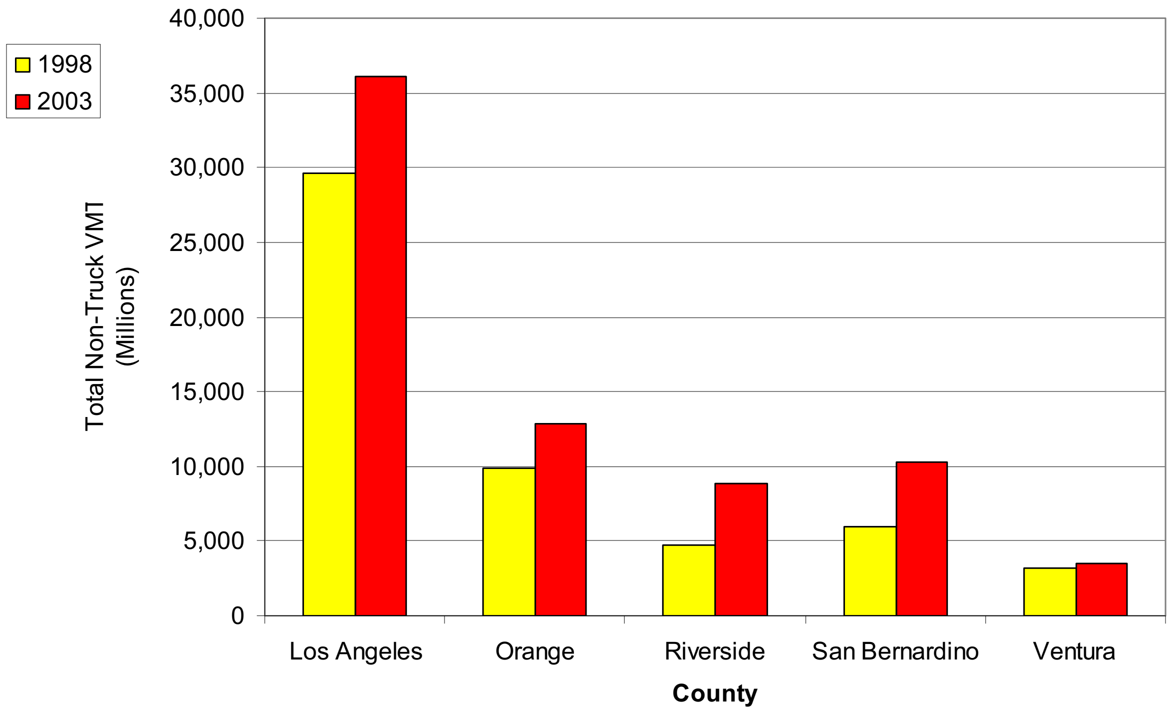
Figure 15
Truck Vehicle Miles of Travel (VMT) by County on the State Highway System within the MCGMAP Study Area
1998 and 2003



Source: "Truck Miles of Travel: California State Highway System 1988-2003," Caltrans, 2005

In this same five-year period, non-truck travel in the study area has also increased. Figure 16 displays the change in non-truck VMT between 1998 and 2003, indicating that non-truck VMT increased in all counties as well as in the study area as a whole. From 1998 through 2003, VMT grew by 21 percent in Los Angeles County, 30 percent in Orange County, and 11 percent in Ventura. VMT in Riverside and San Bernardino Counties grew by 87 and 73 percent respectively. Los Angeles County, with 36 millions VMT, has the highest VMT in the MCGMAP study area.

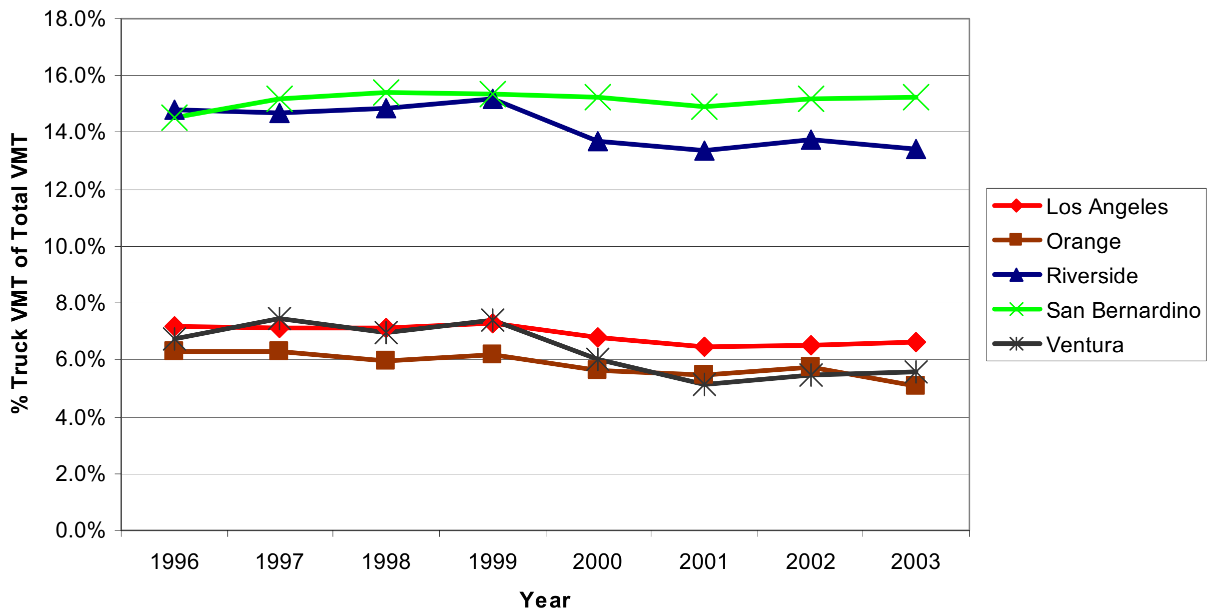
Figure 16
Non-Truck Vehicle Miles of Travel (VMT) on the State Highway System within the MCGMAP Study Area
1998 and 2003



Source: Truck Miles of Travel: California State Highway System 1988-2003, Caltrans, 2005

Based on the values in Figures 15 and 16 above showing truck VMT and non-truck VMT growth in the study area, it is apparent that non-truck VMT growth exceeds truck VMT growth in both percentage and in total numbers. The result is that the share of truck traffic on the highway system has remained relatively flat. Figure 17 displays the change in truck VMT as a percentage of total VMT from 1998 to 2003. Results indicated that Riverside and San Bernardino Counties, with heavy concentrations of industrial/warehousing activity, also have the highest concentration of heavy duty truck volumes and truck percentages on arterials. This data shows that although the share of truck VMT has declined slightly throughout the study area, it has remained relatively flat as a share of total VMT.

Figure 17
Historical Percentage of Truck Vehicle Miles of Travel (VMT) to Total VMT on the State Highway System within the MCGMAP Study Area
1998 to 2003



Source: Truck Miles of Travel: California State Highway System 1988-2003, Caltrans, 2005

Truck Travel Patterns

Thus far the analysis of existing conditions has identified the inventory of the highway system, the volumes throughout the system, and growth rates in truck traffic. This section will evaluate truck travel patterns in the system.

In 2002, SCAG completed a survey of truck traffic across directional screenlines in the study area. The study differentiated between three truck types: light-heavy duty (LHD) trucks, medium-heavy duty (MHD) trucks, and heavy-heavy duty (HHD) trucks. LHD trucks typically include two-axle and three-axle panel trucks (e.g., UPS, FedEx), utility service vehicles, and bobtails. MHD trucks typically include three-axle and some four-axle trucks such as bobtails with chassis and empty flatbeds. HHD trucks typically include bobtails with containers, liquid bulk, full flatbeds, and other multi-axle units. Table 10 shows the truck AADT counts across 15 screenlines created for the 2002 SCAG Goods Movement Truck Count Study. Screenlines are imaginary lines across transportation study areas; they are placed to determine the magnitude of traffic crossing those imaginary lines in order to assess the impacts of travel. The screenline locations are shown in Figure 18. Table 10 presents truck counts by truck type, and is indicative of the directional movement of trucks within and through the study area.

Table 10
Truck Counts by Type across MCGMAP Study Area Screenlines

Screenline	County	Freeways	Description of Travel	Total Daily Trucks
1	Los Angeles	I-5, SR-2, U.S. 101, I-405	North – South	54,991
2	Los Angeles	I-10, SR-60, I-5, I-105, SR-91, I-405	East – West	144,883
3	Los Angeles	I-110, I-710, I-405	North – South	66,515
4	Orange	SR-57, SR-91, I-5, SR-22, I-405	Out of OC/Into OC	90,899
5	Orange	I-5, SR-57, SR-91, I-405	Out of S. LAC/Into S. LAC	91,934
6	San Bernardino	SR-91, I-10, SR-60	East – West	85,143
7	San Bernardino	I-215, I-15	North – South	57,680
8	Los Angeles	I-210, I-10, SR-60	East – West	80,167
9	Riverside/San Bern.	SR-60, SR-30, I-10, SR-74	East – West	25,058
10	Ventura	SR-118, U.S. 101, SR-126	East – West	20,617
11	Ventura	U.S. 101, SR-126, SR-118	East – West	17,220
12	Riverside	I-10, SR-111	Out of Imp. Co./Into Imp. Co.	14,647
13	San Bernardino	I-15, SR-138, SR-18	Out of SB Co./Into SB Co.	2,664
15	Riverside	I-15, SR-91, I-215	North – South	24,975

Source: SCAG Goods Movement Truck Count Study, 2002.

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Wilbur Smith Associates

Figure 18
SCREENLINE LOCATIONS

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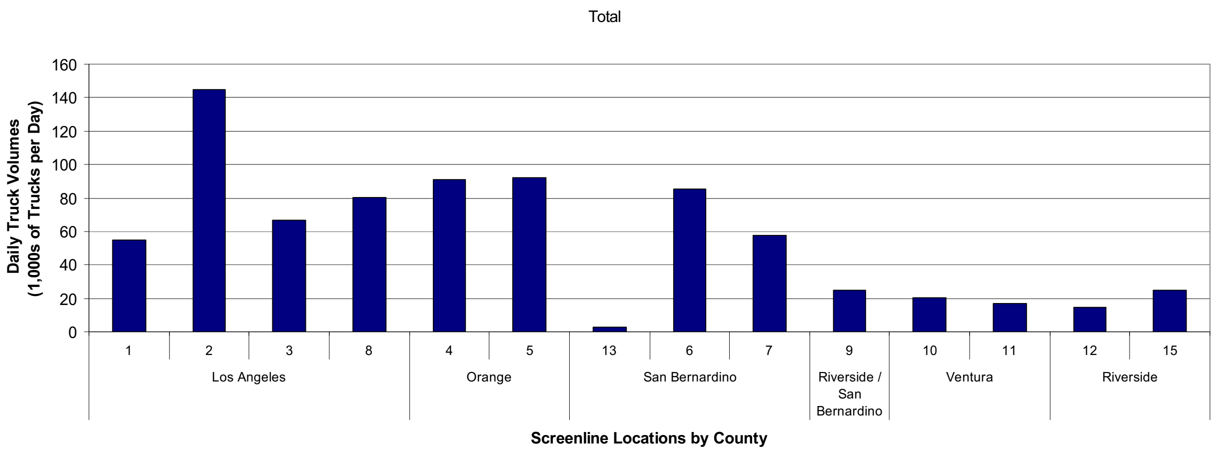
The data contained on Table 10 is also shown graphically in Figure 19.

Figure 19
Truck Counts by County across MCGMAP Study Area Screenlines



Source: SCAG Goods Movement Truck Count Study, 2002

As shown, the highest volume of daily truck traffic occurs in the eastbound and westbound directions in Los Angeles County. This includes truck movements along I-10, SR-60, and SR-91.

There are several key findings from the truck travel pattern analysis:

- Rapid growth in port-related truck freight from Los Angeles through San Bernardino and Riverside Counties increased truck volume in this region. Major freeway facilities providing the transportation capacity for this travel demand include I-10, I-15, SR-60, and SR-74.
- The most significant goods movement patterns in the study area are east-west within Los Angeles County, which translate to the following spin-off patterns:
    - Travel patterns to and through San Bernardino and Riverside Counties and other points eastward
    - Travel patterns to and from Orange County, and through Orange County to points in San Bernardino and Riverside Counties and points east, as well as north-south to San Diego County
- The second most significant travel patterns are north-south within Los Angeles County between the ports and intermodal yards and warehouse distribution centers.
- North-south travel patterns between San Bernardino and Riverside County are also significant, and include flow to and from Orange County and San Diego County as well as to and from points north.
- Travel patterns north-south between Los Angeles County, Ventura County, and Kern County are also significant.

- Major portions of the truck travel patterns are extremely congested during the PM peak period, particularly in Los Angeles and Orange Counties and the areas immediately to the east and west.

In the Southern California region, the SR-60, I-710, and I-15 freeways are heavily impacted by trucks now and will become more congested in the future. SCAG has been studying truck lanes and full truckways along I-710 (SCAG, I-710 Corridor Study, March 2005), SR 60 (SCAG, SR-60 Truck Lane Feasibility Study, February 2001) and I-15 (SCAG, I-15 Comprehensive Corridor Study, December 2005).[37]

The SR-60 corridor between I-710 and I-15 is one of the most heavily used freeways by trucks engaged in inter- and intra-regional goods movement, serving both port and domestic traffic. It is of major importance in the distribution of consumer goods, and facilitates international trade.

Truck origin and destination travel patterns on the SR-60 corridor were studied in 2001. The results are summarized as follows:

- Approximately 5 percent of the trucks using SR-60 either enter or exit the SR-60 corridor west of I-710
- 13 percent of the trucks arrive at SR-60 via I-710, including 9 percent to/from the south and 4 percent to/from the north
- I-605 contributes 13 percent to the SR-60 truck volume, including 7 percent to/from the south and 6 percent to/from the north
- Roughly 6 percent of the trucks on SR-60 enter or exit using SR-57, including 4 percent to/from the south and 2 percent to/from the north
- I-15 to the north of SR-60 carries 54 percent of all heavy duty trucks

The 1998 Caltrans congestion map divided the SR-60 corridor into three separate segments: from I-710 to I-605, from I-605 to SR-57 north, and from SR-57 north to I-15. Caltrans has identified level of service (LOS) F as acceptable for all segments of the corridor. In 1998, all three segments of SR-60 were already experiencing level of service worse than "F_0" ("F_2" and "F_3"). Note that LOS F is typically considered failing and the point at which demand far exceeds capacity. Caltrans has designated LOS F for the most congested freeway segments, in order to compare operational characteristics.

Table 11
Summary of Year 2001 Freeway Congestion on SR-60

	AM Period				PM Period			
Segments	Period of Congestion	Average Travel Time (minutes)	Average Speed (mph)	Level of Service	Period of Congestion	Average Travel Time (minutes)	Average Speed (mph)	Level of Service
I-710 to I-605	6:30 to 8:45	15	34	F_2	15:45 to 19:15	18	28	F_2
I-605 to SR-57	6:15 to 8:45	32	22	F_3	15:15 to 19:45	23	31	F_2
SR-57 to I-15	5:00 to 8:45	14	26	F_2	16:00 to 18:00	7	43	E

Source: SCAG, "SR-60 Truck Lane Feasibility Study," February 2001

The I-15 corridor stretches from the San Diego County line to the Mojave River crossing on the northern edge of the City of Victorville in San Bernardino County. I-15 is the primary freight corridor between Los Angeles (and western Mexico) and all states (and Canadian provinces) to the north and east. As seen in Table 12, the percent of all traffic consisting of heavy trucks was computed for daily traffic by direction for the AM and PM peak periods. Approximately 15 percent of trucks travel on a daily basis during the AM peak period in the northbound direction.

Table 12
Summary of I-15 Total ADT and Truck Percentages Year 2001

Travel Demand and Patronage on the year 2000	ADT	Truck Percentage
Average Daily Traffic		
I-15 NB & SB TOTAL (vehicles per day)		
Trucks Only	14,854	
Total	88,951	**0.17**
AM Peak Period (6-9 AM) Traffic - NB ONLY		
Trucks Only	824	
Total	5,386	**0.15**
AM Peak Period (6-9 AM) Traffic - SB ONLY		
Trucks Only	1,103	
Total	10,046	**0.11**
PM Peak Period (3-7 PM) Traffic - NB ONLY		
Trucks Only	1,407	
Total	12,774	**0.11**
PM Peak Period (3-7 PM) Traffic - SB ONLY		
Trucks Only	1,162	

Source: SCAG, I-15 Comprehensive Corridor Study, December 2005

A study on the I-15 corridor was completed in 2005. The results are summarized below:

- Average daily traffic on I-15 at SR-138 is currently between 110,000 and 120,000 vehicles; the AM peak period is between 6:00 AM and 8:00 AM, while the PM peak period is between 3:00 PM and 6:00 PM.
- The PM peak period is 10 percent to 15 percent higher than the average weekday peak. This creates a longer period of congestion and an extended peak, particularly in the northbound direction on a Friday evening and in the southbound direction on a Sunday afternoon.
- Over 13 percent of the weekday traffic on I-15 is trucks, with the share of trucks increasing to over 16 percent during the midday hours.
- The I-15 truck climbing lane between SR-138 and the Cajon Summit increases northbound capacity to five lanes on this segment of the freeway.

The I-710 corridor is the principal transportation connection between East Los Angeles and the ports of Long Beach and Los Angeles. It plays an important role in the regional, statewide, and national transportation system. A large number of trucks use I-710 to travel between the ports and inland destinations (warehouses, distribution centers, and intermodal transfer yards).

A major corridor study of I-710 was completed in 2005. The results are summarized below:

- I-710 experiences an accident rate that is well above the statewide average for freeways of this type.
- 50 percent of trucks leaving the POLA and POLB ferry containers to an intermodal rail yard facility via I-710 for transshipment to other parts of the U.S. outside of Southern California.
- The I-710 freeway carries heavy truck volumes over its entire length. Total truck traffic south of I-405 is currently over 20,000 truck trips per day, or 20 percent of all traffic.
- There is a significant lack of storage on many of the off-ramps throughout the corridor.
- Several segments along I-710 are constructed with non-standard lane widths, which reduce speed, motorist comfort level, and overall capacity.
- The shoulders provided are narrow in width, and in some segments no shoulders are provided at all.
- The weaving distance is significantly constrained by both the spacing of the interchanges and ramp configurations. This negatively impacts the mainline freeway capacity and safety.
- Near Long Beach, trucks make up nearly twenty percent of the traffic stream during the day, compared with an average daily truck percentage of 6 to 13 percent on similar freeways in Los Angles County.

Near Long Beach, trucks make up nearly 20 percent of the traffic stream during the day, compared with an average daily truck percentage of 6 to 13 percent on similar freeways in Los Angeles County. Table 13 presents a summary of truck percentages along I-710.

Table 13
I-710 Total AADT and Total Trucks Year 2004

Locations	AADT Total	Total Trucks	Total Truck %
BEGIN ROUTE, LONG BEACH FREEWAY	54000	7679	14.22
LONG BEACH, JCT. RTE. 1, PACIFIC COAST H	153000	21757	14.22
JCT. RTE. 405	178000	26130	14.68
DEL AMO BOULEVARD INTERCHANGE	179000	26653	14.89
LONG BEACH, JCT. RTE. 91, ARTESIA FREEWA	218000	37888	17.38
JCT. RTE. 105	227000	38272	16.86
FIRESTONE BLVD	215000	36550	17
COMMERCE, JCT. RTE. 5, SANTA ANA FREEWAY	225000	32895	14.62
JCT. RTE. 60	191000	11385	12.18
MONTEREY PARK, JCT. RTE. 10, SAN BERNARD	42500	2423	5.7
PASADENA, JCT. RTES. 134 AND 210	69000	1497	2.17

Source: Caltrans, 2004 Truck Volumes

The I-10 corridor is one of the top 25 highway freight bottlenecks in the U.S.[38] The I-10 corridor is more than 2,600 miles long, of which approximately 1,900 miles are rural and 721 are urban. Inter-regional trade between the I-10 corridor region and the rest of the United States generates significant economic benefits in terms of jobs, earnings, and economic output. Inter-regional trade produced $305.5 billion in spending within the I-10 region (55.6 percent), while $243.8 billion (44.4 percent) occurred in the other regions of the country. Some 2.25 million jobs in the I-10 region and 1.87 million jobs in the rest of the United States are supported by inter-regional freight movements which utilize the I-10 corridor. The jobs supported by I-10 inter-regional trade generated $75.3 million and nearly $59 million in earnings in the I-10 region and the rest of the United States, respectively.

The National I-10 Freight Corridor Study presented the following results in 2003:

- Hypothetically, a significant improvement on deficient mileage (segments of highway with unacceptable levels of service (LOS)) could be achieved by removing all truck traffic from the corridor. The modeling exercise predicted that average car speeds would jump by over 8 percent, and as much as 32 percent during peak hours.
- Average truck speed on rural interstate sections during the peak hour is 58.6 mph and on urban interstate sections is 26.1 mph.
- The corridor currently has approximately 400 miles operating at an unacceptable LOS, with nearly two-thirds of the deficient mileage classified as urban.
- The total I-10 corridor is more than 2,500 miles long. Two-thirds of these miles are rural. However, the number of trucks traveling on urban roadway each day is 42% higher than rural roadways.

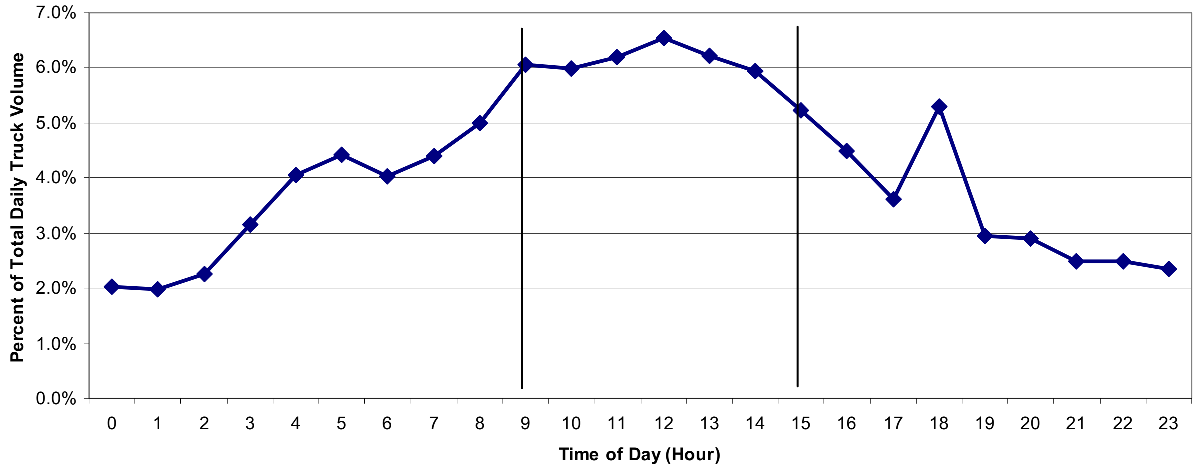
Time of Day Distribution of Truck Travel

The purpose of this section is to evaluate the hourly distribution of truck traffic throughout an average day. A common assertion is that truck traffic creates a significant conflict with commuter traffic and consumes peak hour traffic capacity, thereby contributing to delay for the average traveler going to or from work. Existing screenline data has been used for this analysis.

As part of the 2002 SCAG Goods Movement Truck Count Study,[39] hourly truck count data were obtained along selected screenlines. These screenline locations are shown in Figure 18 above. The hourly truck count data provide insight into the distribution of truck travel into and out of the study area over a 24-hour period. The screenlines are located near the northern, southern, and eastern edges of the study area. The data are useful for identifying the hourly distribution of truck travel coming in or going out of the study area throughout the day.

Figure 20 displays the hourly distribution of total truck traffic for eastbound and westbound movements across a screenline across I-10, SR-60, and SR-91 to the west of I-15. This location provides information about truck flows into and out of the study area from the east. Summing the hourly distribution percentages in Figure 20 shows that approximately 37 percent of all daily truck travel occurs after 9:00 AM and before 3:00 PM (between commuter peak periods), while approximately 31 percent of all daily truck travel occurs between 7:00 PM and 6:00 AM (night hours). The remaining 32 percent of total daily truck travel occurs between the hours of 6:00 AM to 9:00 AM and 3:00 PM to 7:00 PM (peak commuter travel hours). Therefore, more than two-thirds of all daily truck travel to and from points east of the study area occurs during off-peak times.

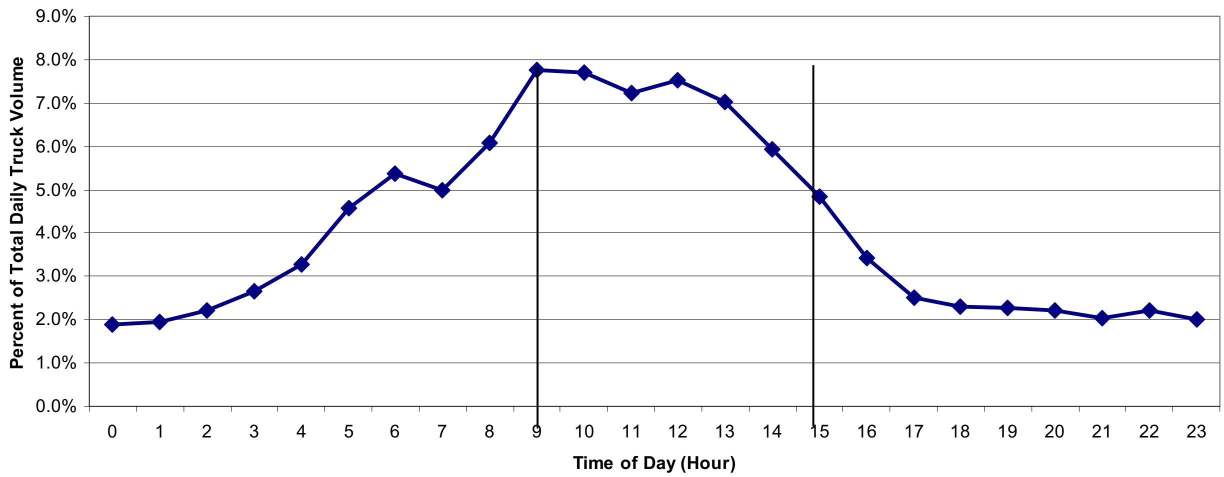
Figure 20
Hourly Distribution of East-West Truck Traffic in the Eastern Part of Study Area



Source: SCAG Goods Movement Truck Count Study, 2002

For information on the movement of trucks into and out of the study area from the south, an east-west screenline along I-5 and I-405 near Fountain Valley in Orange County was used. Summing the hourly distribution percentages in Figure 21 shows that approximately 43 percent of all daily truck travel occurs between the commuter peak travel periods, while approximately 30 percent of all daily truck travel occurs during night hours. Nearly 75 percent of all daily truck travel to and from points south of the study area occurs during off-peak times. The remaining 27 percent of total daily truck travel occurs during commuter travel peak hours.

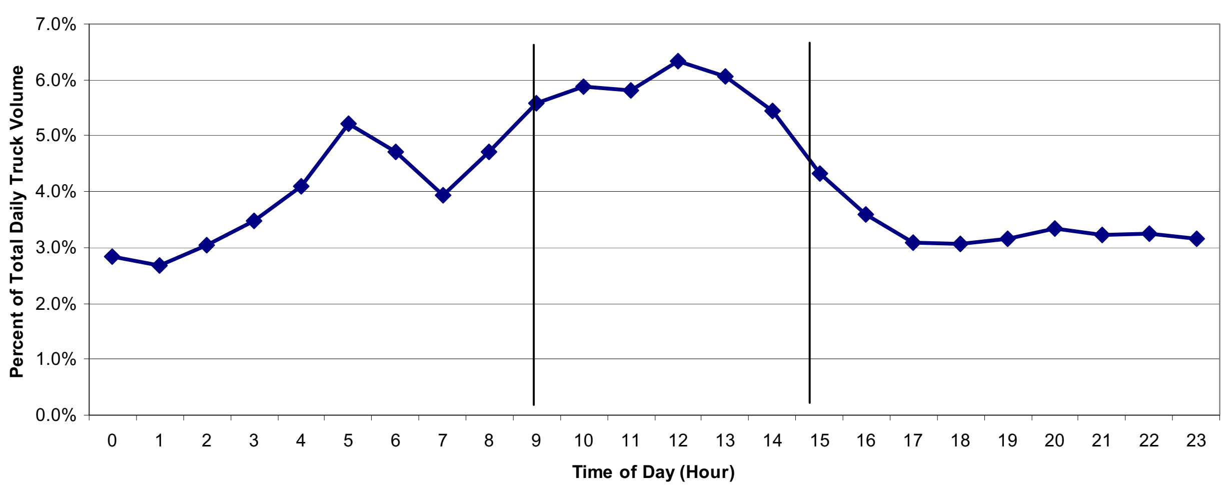
Figure 21
Hourly Distribution of North-South Truck Traffic - Southern Parts of Study Area



Source: SCAG Goods Movement Truck Count Study, 2002

For information on the movement of trucks into and out of the study area from the north, an east-west screenline consisting of I-5 and I-405 south of U.S. 101 in Los Angeles County was used (Figure 22). Approximately 35 percent of all daily truck travel occurs between commuter peak travel periods, while approximately 37 percent of all daily truck travel occurs at night; i.e., nearly 75 percent of total daily truck traffic occurs during off-peak periods of the day. Approximately 27 percent of total daily truck travel occurs during the peak commuter periods.

Figure 22
Hourly Distribution of North-South Truck Traffic - Northern Parts of Study Area



Source: SCAG Goods Movement Truck Count Study, 2002.

The key finding from these data is that while there is substantial truck and commuter traffic interaction during traditional commuter travel periods, the bulk of truck traffic does not occur during these periods, and tends to peak during the midday hours. Approximately two thirds of truck travel occurs during the off-peak hours. The amount of truck traffic that occurs during peak commuter periods is almost equivalent to the share of truck traffic that occurs during night hours. It should be noted that these data were collected before the advent of PierPass, the extended gate hour program at the ports, which began in July of 2005.

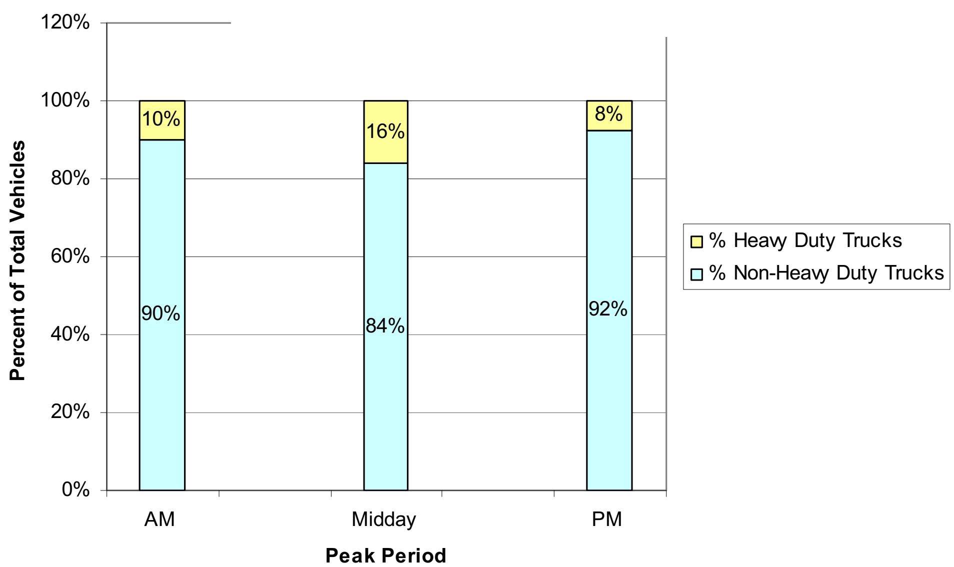
Time of Day in Relation to Non-Truck Traffic

Since hourly truck traffic distribution patterns do not exactly match commuter travel patterns, it is important to evaluate the degree to which they do interact. An analysis of the distribution of both truck traffic and non-truck traffic during three peak periods of the day was developed using data from the SCAG Subregional Freight Movement Truck Access Study.

Figure 23 illustrates the peak period percentages of truck traffic as compared to non-truck traffic on a portion of I-15 between I-10 and SR-60. This segment of I-15 currently carries the heaviest two-way truck volumes in western San Bernardino and Riverside Counties.[40] The peak periods presented in Figure 23 correspond to the following hours of the day:

- AM: 6:00 AM to 8:00 AM
- Midday: 11:00 AM to 1:00 PM
- PM: 4:00 PM to 6:00 PM

Figure 23
2003 Peak Period Truck Percentages as
Share of Total Traffic Volume on I-15 between I-10 and SR-60



Source: SCAG Subregional Freight Movement Truck Access Study, July 2004

The most revealing finding from this data is that truck travel represents a small share of overall travel, regardless of the time of day. During the AM peak period, truck traffic represents 10 percent of overall traffic, compared to eight percent during the PM peak. Even during the midday peak, when truck traffic is at its highest, the share of truck traffic is 16 percent of total traffic.

Port-Related Truck Travel

Near the ports within the MCGMAP study area, the freeway facilities carry large numbers and percentages of truck traffic going to or from the port facilities. The further the freeways are from the ports, the less port-related truck activity occurs on study area roadways. This is not to say that truck traffic is reduced at points further from the ports; for example, previous discussion in this section shows high volumes of truck travel in areas removed from the ports such as in Riverside and San Bernardino Counties. The roadway facilities further from the ports carry goods to distribution warehouses and rail yards within the study area, and serve not only direct port truck trips, but also trips associated with transloaded goods on the second or third link of the goods movement chain.[41]

In 2004, the POLA commissioned the Baseline Transportation Study to identify the existing truck traffic volumes to and from the port.[42] The study yielded useful data to identify the specific port-related truck traffic on roadways within the study area. The study defines port-related trucks as container trucks traveling to and from the San Pedro Bay port facilities). The data from the 2004 POLA study were analyzed in conjunction with Caltrans truck count data for the same roadway segments to identify the percentage of port-related trucks compared to the total truck volumes on study area roadways. The results of this analysis are shown in Table 14.

There are two key observations to be made from this data.

- I-710 is the primary and dominant corridor for port-specific traffic.
- The further north from the ports, the lower the amount of port-related traffic. While total truck traffic shows no significant trend in volumes or as a share of total vehicle traffic, the share of port-specific truck traffic declines sharply in terms of its share of total truck traffic further away from the ports.

These results would indicate that a significant share of truck traffic on I-710, as well as on the other roadways, quickly peels off the main system on their way to/from intermodal yards and warehouse distribution centers. The transload business also is a major contributor to this pattern.

The 2004 POLA study states that a significant decrease in container truck activity was noted on the I-710 and I-110 freeways during the 2004 port congestion; however, less of a reduction was noted on SR-60 and SR-91,[43] likely due to the fact that those facilities used by large shippers of intermodal cargo (such as Wal-Mart and Target) transload cargo transported with the trucks to inland destinations.

Table 14
Comparison of Port Truck Volumes to Total Daily Truck Volumes on Study Area Roadways, Year 2003

Highways	Segments	Total Daily Vehicle Volume	Total Daily Truck Volume	Daily Port Truck Volume	Total Trucks as % of Total Vehicle Volume	Port Trucks as % of Total Truck Volume
I-110	PCH to Sepulveda	148,000	9,900	7,810	6.7%	78.9%
	Sepulveda to I-405	226,000	11,900	7,335	5.3%	61.6%
	I-405 to SR-91	266,000	23,900	6,015	9.0%	25.2%
	SR-91 to I-105	247,000	17,800	4,680	7.2%	26.3%
	I-105 to I-10	324,000	15,900	2,485	4.9%	15.6%
I-710	PCH to Willow	146,000	25,400	23,900	17.4%	94.1%
	Willow to I-405	161,000	27,100	23,235	16.8%	85.7%
	I-405 to SR-91	186,000	31,400	20,045	16.9%	63.8%
	SR-91 to I-105	227,000	38,300	15,315	16.9%	40.0%
	I-105 to I-5	237,000	34,600	11,685	14.6%	33.8%
	I-5 to SR-60	199,000	24,200	1,025	12.2%	4.2%
	SR-60 to I-10	132,000	11,300	845	8.6%	7.5%
I-405	I-605 to I-710	289,000	15,700	1,875	5.4%	11.9%
	I-710 to I-110	283,000	15,400	2,965	5.4%	19.3%
	I-110 to SR-91	270,000	14,600	1,960	5.4%	13.4%
	SR-91 to I-105	294,000	12,100	1,810	4.1%	15.0%
	I-105 to I-10	310,000	12,800	1,590	4.1%	12.4%
SR-91	SR-57 to I-5	250,000	21,800	1,135	8.7%	5.2%
	I-5 to I-605	283,000	39,900	1,470	14.1%	3.7%
	I-605 to I-710	263,000	37,100	2,870	14.1%	7.7%
	I-710 to I-110	212,000	13,700	1,385	6.5%	10.1%
	I-110 to I-405	67,000	1,500	195	2.2%	13.0%
I-105	I-605 to I-710	212,000	18,800	2,800	8.9%	14.9%
	I-710 to I-110	231,000	14,700	1,605	6.4%	10.9%
	I-110 to I-405	243,000	13,800	390	5.7%	2.8%
I-5	SR-57 to SR-91	223,000	21,400	225	9.6%	1.1%
	SR-91 to I-605	199,000	18,600	160	9.3%	0.9%
	I-605 to I-710	249,000	23,200	195	9.3%	0.8%
	I-710 to SR-60	267,000	20,600	1,800	7.7%	8.7%
	SR-60 to I-10	247,000	20,400	710	8.3%	3.5%
SR-60	SR-57 to I-605	265,000	23,200	1,560	8.8%	6.7%
I-10	SR-57 to I-605	259,000	18,100	1,775	7.0%	9.8%
	I-605 to I-710	234,000	14,200	585	6.1%	4.1%
	I-710 to I-5	254,000	9,000	190	3.5%	2.1%
	SR-60 to I-110	284,000	21,600	300	7.6%	1.4%

Table 14
Comparison of Port Truck Volumes to Total Daily Truck Volumes on Study Area Roadways, Year 2003

Highways	Segments	Total Daily Vehicle Volume	Total Daily Truck Volume	Daily Port Truck Volume	Total Trucks as % of Total Vehicle Volume	Port Trucks as % of Total Truck Volume
I-605	I-405 to SR-91	245,000	11,300	20	4.6%	0.2%
	I-105 to I-5	297,000	41,900	4,100	14.1%	9.8%
	I-5 to SR-60	265,000	37,400	3,825	14.1%	10.2%
	SR-60 to I-10	224,000	26,800	1,815	12.0%	6.8%
SR-57	I-5 to SR-91	276,000	18,800	10	6.8%	0.1%
	SR-91 to SR-60	296,000	23,400	135	7.9%	0.6%
	SR-60 to I-10	139,000	8,100	40	5.8%	0.5%

Sources: "Baseline Transportation Study," Port of Los Angeles, 2004, p. 39; Caltrans Truck Volumes 2004 (Year 2003 Data)

2.4 PORTS

This section presents the existing conditions at the various airports and seaports in the study area. Figure 24 shows the locations of regional seaports and airports.

The section on airports provides a breakdown of the air cargo business sector, summarizes the level of air cargo activities, and provides an inventory of the air cargo system. The section on seaports provides an overview of the study area's port facilities as well as the types and volumes of cargo handled by the ports. Section 4 – Constraints, Issues, and Problems discusses the specific issues related to the existing ports operations in the study area.

Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

Figure 24
PORTS IN THE MCGMAP STUDY AREA
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Air Cargo and Cargo Airports

Although there are ten airports in the study area, 95 percent of air cargo activity is centered at Los Angeles International (LAX), Ontario International (ONT), and Santa Ana (SNA). These airports serve as national and international cargo gateways from and to the study area. Long Beach (LGB), Burbank (BUR), and John Wayne Orange County Airport (SNA) account for the remaining five percent of the study area's air cargo activity.

The air transport of goods is critical to the future growth of the economy of the study area. In recent years, air cargo has been the fastest growing segment of the goods movement industry in the United States, placing increasing demands both on airports and ground transportation to and from airports. Section 4 – Constraints, Issues and Problems of the Tech Memo summarizes the specific issues related to the existing air cargo operations in the study area.

The Overall Air Freight Structure

The air freight industry is classified into five major types of carriers:

- **Integrated Air Cargo Carriers** – These include Federal Express (FedEx), UPS, DHL, Airborne, Emery, and BAX. What makes them unique is that they provide door-to-door service via any combination of modes (air, truck, and rail intermodal). One company, UPS, uses rail intermodal as a substitute for trucking on some of its extensive line-hauls. These integrated air cargo carriers control the reliability of service by owning some of the ground transport operations as well as the air lift capacity, exercising control through ownership. They also use information technology to exercise control. FedEx and UPS are the dominant companies in domestic integrated business, but both companies operate internationally, operating a network of hub airports for processing freight. DHL specializes in international freight and dominates that market, while providing less extensive service domestically through fewer service options.
- **Non-integrated (Cargo-only) Carriers** – This sector does not provide an integrated door-to-door service, but provides only line-haul service for the airport to airport portion, typically international. Shippers, freight forwarders, cargo handling companies, and other carriers buy lift capacity from them. Carriers like Cargolux, Nippon, and Evergreen International Aviation provide scheduled service to major markets, which can be utilized by shippers or freight forwarders as needed. Other firms in this segment, such as Atlas and Gemini, provide outsourcing, carrying contracted freight for freight forwarders and other airlines.
- **Passenger Belly** – Most international flights between major cities use wide-body aircraft which have enough space in the "belly" below the passenger level to carry all the passenger baggage as well as commercial cargo. The bulk of international air cargo (70 to 80 percent) is carried by passenger belly service because of the pricing advantage offered by the extra belly space. The largest airline cargo carriers in this sector in the study area are Lufthansa, Korean Air, Singapore Airlines, Air France, Japan Airlines, British Airways, Cathay Pacific, KLM, United Airlines, Northwest Airlines, and American Airlines. However, all-cargo

carriers are rapidly gaining market share on international routes. At LAX, 66 percent of international air cargo is handled by all-cargo carriers (integrated and non-integrated), with just 34 percent being passenger belly freight.

- **Postal Services** – While most of the mail shipped in the U.S. travels in ground vehicles, some does travel by air. While the U.S. Postal Service (USPS) typically provides overnight mail services, it does not operate its own airline; mail is carried in the belly of domestic passenger aircraft and under contract with other air cargo carriers. Although it is the largest transportation organization in the world, it handles only a modest share of the air freight shipped in the U.S. (about 10 percent of weight[44]).
- **Freight Forwarders** – While freight forwarders do not operate as carriers, they contribute significantly because they handle and manage the shipment of air cargo on behalf of shippers, particularly international shipments. They buy air lift capacity from passenger belly space as well as cargo-only carriers. In another class, some freight forwarders specialize in very urgent "next-flight-out" service. Here the emphasis is on domestic shipments for which next-day service is inadequate. This class of forwarder has developed partnerships with airlines and couriers for door-to-door service, especially within the United States. Examples include UPS' Sonic Air subsidiary, FedEx "SameDay" service, and "NextJet."

Air Cargo Activities in the Study Area

The study area has five commercial airports that handle air cargo: LAX, ONT, BUR, LGB, and SNA. Table 15 shows air cargo flows at these five airports. It is important to note that there are other commercial airports in the study area including San Bernardino International Airport (SBD) and Palmdale Regional Airport (PMD).

The bulk of the air cargo service providers are located at LAX. In 2005, according to the data presented in Table 15, LAX handled over 75 percent of the study area's air cargo, followed by ONT with 20 percent, with the remaining five percent shared among BUR, LGB, and SNA.

Table 15
Air Cargo Activity 2003-2005 MCGMAP Study Area Airports
Tons of Air Cargo

Airport	2003	2004	2005	2005 Market Share
Los Angeles (LAX)	2,022,076	2,115,314	2,137,188	75.2%
Ontario (ONT)	571,992	605,211	575,369	20.2%
Long Beach (LGB)	56,081	57,050	54,298	1.9%
Bob Hope (BUR)	47,634	49,633	52,867	1.9%
John Wayne (SNA)	15,816	20,796	24,103	0.8%
Total	**2,713,599**	**2,848,004**	**2,843,825**	**100.0%**

Source: SCAG Region Aviation Activity Report, 2003-2005

Note that both March GlobalPort (RIV) and Southern California Logistics Airport (VCV) are two airports in the study area that are both aggressively trying to attract air cargo. RIV was successful in attracting a DHL west coast hub in late 2005, and VCV has attracted sporadic ad-hoc charter cargo. However, to date these airports have not reported any significant air cargo volumes. This will change in 2006 for RIV with the first full year of service for the newly introduced DHL hub.

The leading reason for the concentration at LAX is the broad range of service options and flights available to service providers. As a whole, air cargo carriers and service providers tend to gravitate toward airports that offer the broadest range of flights and destination options. Air cargo is a time- sensitive business, and service providers want the flexibility to choose between a variety of different flight options to meet customer service and pricing needs. LAX offers the greatest variety of flights and destinations, making it a preferred location for service providers. Of course, other factors such as infrastructure to support cargo operations, including air freight terminals, runways for larger aircraft, freight forwarders, trucking companies, customs, and Department of Agriculture inspections are also important.

There is additional research suggesting that LAX is the most centrally located (and fully functioning) airport relative to the study area's population and employment. The research also shows that it is easier to retain employees at LAX due to its accessibility and location.[45] Nonetheless, the fundamental market driver for the concentration of goods movement activities at LAX is the broad variety of flight options and destinations available to air cargo service providers.

ONT ranks as the second largest air cargo operation in the study area because UPS operates its West Coast hub there. In fact, UPS is the largest air cargo handler at that airport, where it accounts for 78 percent of the airport's freight traffic (not counting mail). Other airports in the study area (BUR, LGB, and SNA) have limited freight service, principally FedEx and UPS flights to domestic hub airports.

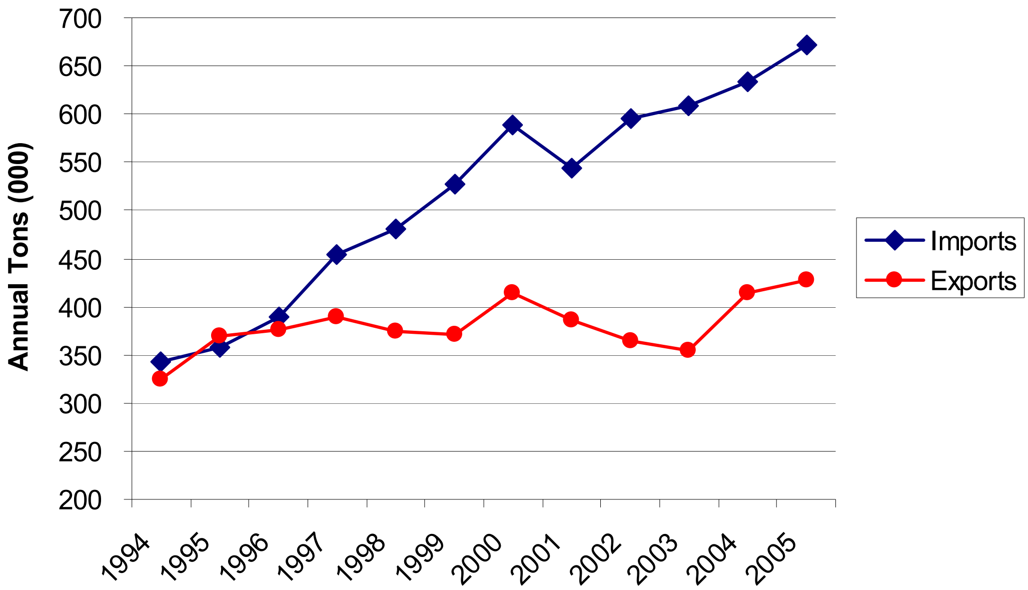
Inventory of Air Cargo Systems

The following is a discussion of existing air cargo systems at the study area's air cargo airports.

Los Angeles International Airport - LAX is the world's sixth busiest in air cargo tonnage, handling nearly 2.14 million tons in 2004. LAX handled about 70 percent of the passengers, 75 percent of the air cargo, and 95 percent of the international passengers and cargo traffic in the five-county MCGMAP study area in 2004.

LAX is a key transportation center for one of the world's most dynamic economies. Los Angeles World Airports (LAWA) notes that international trade is valued at $200 billion, with LAX alone responsible for more than $69 billion in exports and imports.[46] Between 2000 and 2005, the tonnage of international air freight passing through LAX rose 9.3 percent; imports grew by 13.9 percent, while exports grew by 2.8 percent.[47] Figure 25 shows the historical trends in air freight imports and exports at LAX.

Figure 25
Air Freight Imports and Exports via Los Angeles International Airport (1994- 2005)



Source: LAWA international freight statistics, 1994-2005

The total land area of LAX is 3,651 acres, which contain the Central Terminal Area, airfield, air cargo facilities, and ancillary support facilities. The cargo complexes at LAX total over 2.1 million SF.

The 3,651 acres of airport property are within the City of Los Angeles, and the area constitutes a large industrial district. The airport consists of the following cargo-specific facilities and uses:

- Four runways
- Four million SF of passenger terminal space, including nine terminals and 163 aircraft gates
- 170 acres of cargo ramp and 2 million SF of building space concentrated in three cargo complexes
- Approximately 50 trucking firms operate terminals within two miles of the airport perimeter (While most freight forwarders handle air cargo through LAX, many also arrange rail or truck movement.)

LAX is owned and operated by Los Angeles World Airports (LAWA), a Los Angeles City department that oversees LAX, ONT, PMD, and VNY.

Ontario International Airport - ONT is located in San Bernardino County. It is the center of a rapidly developing freight movement system that includes the airport, two railroads, four major freeways (I-10, I-15, SR 60, and SR 83), and an expanding network of freight forwarders. ONT currently consists of 1,463 acres, about a third of which are available for future development. The site is well-suited for the development of air cargo and supporting facilities, considering its proximity to both airfield access ways and public roadways that lead to major interstate highways.

The airport is one of four owned and operated by LAWA. The airport consists of the following cargo specific facilities and uses:

- Two parallel runways
- 96,000 SF of cargo building and office space to support all-cargo, airline belly cargo, and air mail
- 12 major U.S. air freight carriers including Air Transport International, Airborne Express, Ameriflight, DHL, Empire Airways, Evergreen, Express Net, Federal Express, Kalitta Air, West Air, Union Flights, and UPS

The West Coast hub for UPS utilizes ONT as its base of operation, with facilities located both on and adjacent to airport property. It currently processes approximately 70 percent of all cargo at the airport. The USPS also utilizes hangar space to process all first class mail passing through ONT. The other air freighter carriers maintain operating facilities along the south edge of the airport.

UPS also has a 156-acre West Coast Distribution Center adjacent to the airport with access to the ONT airfield. Property is available for development or redevelopment between and adjacent to the existing terminals and to their west for additional passenger terminal and cargo facilities. Developable property is also available on the south side of the airport.

Long Beach Airport - LGB is situated in Los Angeles County and handled 54,300 tons of air cargo in 2005. It is served by FedEx, Airborne Express, and UPS. The airport has four smaller runways between 4,200 and 6,200 feet and one primary runway at 10,000 feet. The airport occupies 1,166 acres.

Bob Hope Airport in Burbank - BUR is the closest airport to downtown Los Angeles. The airport handled nearly 52,900 tons of cargo in 2005, 42 percent of which was inbound and 58 percent of which was outbound. The airport consists of a 6,900-foot and a 5,800-foot runway.

John Wayne Airport/Orange County Airport - SNA is owned and operated by the County of Orange. It is the only commercial service airport in Orange County, located approximately 35 miles south of Los Angeles, between the cities of Costa Mesa, Irvine, Newport Beach, and Santa Ana. Two runways serve commercial and private aircraft: a 5,700-foot main runway and a 2,887-foot general aviation runway. In the year 2005, the total air cargo handled was 24,103 tons.

Potential MCGMAP Air Cargo Airports

Five additional airports in the MCGMAP study area have the potential to handle the study area's air cargo demands. As previously mentioned, March GlobalPort is poised to grow rapidly with the addition of a DHL regional hub, and Southern California Logistics Airport is aggressively expanding its cargo capabilities for large-scale international air cargo operations. The study area's remaining three airports (PMD, SBD, and VNY) currently do not report air cargo activity.

March GlobalPort - A new air cargo operation in the study area is the March GlobalPort at March Air Reserve Base (RIV) in Riverside County, where DHL has signed a 16-year operating agreement with the base to run a new cargo distribution system with a domestic focus. March GlobalPort consists of a 13,300-foot runway and more than 350 acres of runway-accessible property available for development. DHL started with six flights a day and is currently flying eight planes per day. Their plan is to eventually have 12 planes per day, and several of those flights are planned to be international flights.

Southern California Logistics Airport - Another emerging air cargo complex is the Southern California Logistics Airport (VCV) located in Victorville (San Bernardino County), which has facilities for air cargo, rail intermodal, trucking, and warehousing operations, as well as planned industrial space. Overall, VCV has developed a master plan for more than 64 million SF of commercial space. It consists of two intercontinental runways: a 15,050-foot runway, allowing the heaviest aircraft direct, non-stop access to any destination in the world, and a 10,000-foot runway.[48]

Palmdale Regional Airport - PMD is located in the Antelope Valley, in the northeast portion of the city of Palmdale, on a 60-acre site at United States Air Force Plant 42. The airport is owned and operated by LAWA under a joint-use agreement with the U.S. Air Force. The airport has three runways. The airport features a modern 9,000 SF terminal capable of handling up to 300,000 passengers annually. PMD has no commercial service at this time and no reported cargo activity.

San Bernardino International Airport - SBD is a commercial airport supported by a 10,000 foot runway. SBD currently reports sporadic charter cargo flights from Custom Air Transport, HeavyLift, and Kitty Hawk. However, there are no available cargo statistics for SBD.

Van Nuys Airport - VNY is located in the heart of the San Fernando Valley and averages nearly one-half million takeoffs and landings annually, with 454,753 total operations in 2004. It is one of the four airports owned and operated by LAWA. Van Nuys Airport covers 725 acres and has two runways. VNY is a general aviation airport and has no commercial passenger service or reported air cargo activity.

Ocean Cargo and Seaports

The study area is served by the San Pedro Bay ports (POLA and POLB) and by the Port of Hueneme. One-third of all waterborne freight container traffic at U.S. ports is handled by the ports in the study area, while approximately 77 percent of the freight coming into these ports is headed for destinations outside the study area.[49] Nearly $200 billion in trade passing through the ports in 2000 supported a national total of two million jobs, which paid over $61 billion in income.[50]

Inventory of Port Systems

Existing conditions, port operations, the type of cargo handled, and port volumes are described in this section.

Port of Los Angeles - POLA handled cargo worth $189.6 billion in CY 2005. Top trading partners (by cargo value) in CY 2004 were China, Japan, Taiwan, South Korea, and Thailand. As shown in Table 16, the POLA handled over 162 million metric revenue tons (MRT) in FY 2005 (based on 1,000 kilograms or one cubic meter).[51] The port handled 169 million metric revenue tons in CY 2005.

Table 16
Port of Los Angeles Tonnage FY 2005
Metric Revenue Tons (1000s)

Container/Gen. Cargo	144,998
Liquid Bulk	12,798
Dry Bulk	4,313
Total	162,109

Source: Port of Los Angeles, Annual Financial Statements, 2005, p. 16

Leading containerized exports (in CY 2004) at the POLA include paper products, fabric (including raw cotton), pet and animal feed, synthetic resins, and fruits and vegetables. Leading containerized imports (in CY 2004) at the POLA include furniture, apparel, toys and sporting goods, vehicles and vehicle parts, and electronic products.

The POLA comprises 4,200 acres of land and has eight container terminals (1,686 acres) and four dockside intermodal rail yards. In addition, the port has eight liquid bulk terminals, one automobile terminal, three break bulk terminals, and three dry bulk terminals. Table 17 lists the terminal details. The port also has a cruise terminal with two terminal buildings and three berths. Cruise traffic amounted to 1.2 million passengers in CY 2005.

Table 17
Port of Los Angeles Terminal Details

Pier & Berth	Cargo Type	Terminal Operator	Terminal Area	Handling Facilities
195-199	Automobile	Distribution & Auto Service, Inc. (DAS)	129 acres	Extensive rail yard for loading and unloading of auto racks
100	Container	China Shipping Holding Company, Inc.	75 acres	Four post-Panamax cranes with 100' gauge; rail and gate shared with Yang Ming Terminal
121-131	Container	Marine Terminals Corp. (MTC)	186 acres	Eight post-Panamax cranes with 50'-gauge and 40-long-ton main hoist capacity; tophandlers; sidehandlers; forklifts; UTRs; bombcarts; on-dock rail facility
136-139	Container	Trans Pacific Container Service Corp. (TraPac)	173 acres	11 post-Panamax cranes with 100'-gauge and 10-long-ton main hoist capacity
206-209	Container	To Be Determined	86 acres	Four cranes (three 50'-gauge and one 34'-gauge)
212-225	Container	Yusen Terminals, Inc.	185 acres	Four super-post-Panamax with 100'-gauge and 60-long-ton main hoist capacity
226-236	Container	Seaside Terminal Services	205 acres	Eight post-Panamax-plus cranes with 100' gauge and 50-long-ton main hoist capacity
302-305	Container	Eagle Marine	292 acres	On-dock rail service accommodates up to 64 five-platform double-stack railcars
401-406	Container	APM Terminals	484 acres	12 super post-Panamax 100'-gauge cranes; on-dock rail service designed for 12 loading tracks
165-166	Dry Bulk	U.S. Borax, Inc.	7 acres	Transfers cargo to vessels at a rate up to 1000 metric tons an hour
210-211	Dry Bulk	Hugo Neu	22 acres	Metal shear and shredder on site, near-dock rail facilities

Table 17
Port of Los Angeles Terminal Details

Pier & Berth	Cargo Type	Terminal Operator	Terminal Area	Handling Facilities
301	Dry Bulk	Los Angeles Export Terminal, Inc.	120 acres	1,000' bulkloading wharf; rail access for product delivery
70-71	Liquid Bulk	Westway Terminal Co.	14 acres	Tankers can be loaded or unloaded with chemicals, petrochemicals, petroleum products, and vegetable oils
118-119	Liquid Bulk	Kinder Morgan	16 acres	The facility can accommodate either one large tanker or two smaller vessels and/or barges simultaneously
148-151	Liquid Bulk	ConocoPhillips	20 acres	Onsite storage tanks
163	Liquid Bulk	Kaneb	12 acres	Various types of commodities handled include cement, crude, petroleum, oils, fuels, blendstocks, refinery feedstocks, oxygenates, distillates, chemicals, petrochemicals
164	Liquid Bulk	Ultramar	13 acres	Product cap of 926,000 bbls, importing intermediate refining feedstocks to support the Ultramar Refinery operation nearby
167-169	Liquid Bulk	Equilon Enterprises	12 acres	11 storage tanks with total cap. of 530,000 bbls adjacent to the berths
187-191	Liquid Bulk	Vopak	19 acres	83 storage tanks with total cap of 2,500,000 bbls including lube oil, diesel fuel, caustic soda, and vegetable oils; bulk cement distribution facility with 86,000 sq. ft. warehouse

Table 17
Port of Los Angeles Terminal Details

Pier & Berth	Cargo Type	Terminal Operator	Terminal Area	Handling Facilities
238-240C	Liquid Bulk	Exxon Mobil	20 acres	Tankers, barges, and tugs transporting crude oil and finished and semi-finished petroleum products
45-53	Breakbulk	Pasha	24	Breakbulk steel, on-dock rail access
54-55	Breakbulk	Stevedoring Services of America (SSA)	12	Transit shed capacity of 211,290 sq. ft.
174-181	Breakbulk	Pasha	40	Covered on-dock warehouses, transit shed capacity of 235,00 sq. ft., specialized on-dock rail service for steel.

Source: www.portoflosangeles.org

Port of Long Beach - POLB comprises 3,230 acres of land with seven container terminals (1,284 acres) and five dockside intermodal rail terminals. The port also has seven dry bulk terminals, seven liquid bulk terminals, ten break-bulk terminals, and one automobile terminal. Carnival Lines, under a lease with the City of Long Beach, operates a cruise terminal within the Harbor District.

As shown in Table 18, the POLB handled over 159 million metric revenue tons (MRT) in calendar year 2005. The cargo passing through POLB in 2005 was valued at about $100 billion. Top ten trading partners with the POLB are China, South Korea, Japan, Hong Kong, Malaysia, Ecuador, Mexico, Indonesia, Taiwan, and Thailand. Combined these nations accounted for about 98.5 million metric revenue tons, or 62% of the port's total tonnage in 2005.

Table 18
Port of Long Beach Tonnage CY 2005
Metric Revenue Tons (1000s)

	Inbound (Imports)	Outbound (Exports)	Total
Container Cargo	89,415	25,171	114,587
Liquid Bulk	30,269	4,407	34,676
Dry Bulk	2,956	4,210	7,167
Break bulk/Neo-bulk[i]	1,950	812	2,762
Total	124,591	34,601	159,192

Source: Port of Long Beach, Annual Report, 2005, p. 20
[i] Includes steel, vehicles, and lumber

Leading exports by tonnage at POLB include petroleum, chemicals, wastepaper, petroleum coke, scrap metal, plastics, foods, electronics, steel, cotton, and machinery.

Leading imports by tonnage at the POLB include petroleum, electronics, plastics, furniture, clothing, machinery, rubber, cement, chinaware, and hardware.

With a main channel depth of 76 feet and berth water depths exceeding 48 feet (except at Pier C), the POLB can already accommodate large vessels. During the year 2004, eleven 8,000-TEU vessels called at the port. Table 19 presents a summary of the terminals at the POLB.

Table 19
Port of Long Beach
Terminal Summary

Pier & Berth	Cargo Type	Terminal Operator	Terminal Area
A 88-96	Container	SSA Terminals	170 acres
C 60-62	Container	SSA Marine - MatsonTerminal	58 acres + Satellite yards (Matson Auto Service) 11 acres
E24-26	Container	California United Terminals	108 acres
F6-10	Container	Long Beach Container Terminal, Inc.	102 acres
G226-230, J232-236	Container	International Transportation Service, Inc.	246 acres

Table 19
Port of Long Beach
Terminal Summary

Pier & Berth	Cargo Type	Terminal Operator	Terminal Area
J243-247, J266-270	Container	SSA Marine	256 acres
T132-140	Container	Total Terminals International, LLC	351 acres
B82-83	Automobiles	Toyota Logistics Services, Inc.	151 acres
D28-31, D34	Break bulk General; Steel, b.bulk gen. (D34)	California United Terminals	15.6 acres
D50-54	Newsprint	Catalyst Paper	6.9 acres
F204-205	General Break bulk, Steel	Cooper/T. Smith Stevedoring Co., Inc.	21.5 acres
F206-207	Steel, Project Cargo, Machinery, Automobiles	SSA Marine	22 acres
T118	Scrap Metal	Pacific Coast Recycling, LLC	18.9 acres
T122 (T115-116)	Lumber	Weyerhaeuser Co.	17.7 acres
T122	Lumber	Weyerhaeuser Co.	17.24 acres
B82	Bulk Gypsum	New NGC, Inc.	18.4 acres
D32-33	Bulk Cement	Cemex USA	1 acre
D46	Bulk Gypsum	G-P Gypsum Corp.	9 acres
F208	Bulk Cement	Mitsubishi Cement Corp.	4 acres

Table 19
Port of Long Beach
Terminal Summary

Pier & Berth	Cargo Type	Terminal Operator	Terminal Area
F210	Bulk Salt	Morton Salt	5 acres
F211	Petroleum Coke, Bulk Sulfur, Bulk Organic Compost	Koch Carbon, LLC	7 acres
G212-215	Petroleum Coke, Coal, Potash, Borax, Soda Ash, Concentrates, Prilled Sulfur	Metropolitan Stevedore Co.	23 acres
B76-80	Gasoline, Gasoline Blending Stocks, Diesel, Naptha Jet Fuel, Nonenes, Tetramers, Fuel Oils, Carbon Black, Crude Oil	BP Pipelines North America, Inc.	18 acres
B82-83	Gasoline, Gasoline Blending Stocks, Diesel, Toulene, MTBE, and Lube Oil	Petro Diamond Terminal Co.	6 acres
B84-87	Crude Oil, Petroleum Products, Bunker Fuel	Shell Oil Products U.S.	11 acres
D30-31	Tallow, Vegetable Oils	Baker Commodities, Inc.	1 acre
F209 & F211	Petroleum Products, Bunker Fuel	Chernoil Marine Terminal	5 acres
S 101	Miscellaneous Bulk Liquid Chemicals	Dow Chemicals U.S.A	10 acres

Table 19
Port of Long Beach
Terminal Summary

Pier & Berth	Cargo Type	Terminal Operator	Terminal Area
T121	Crude Oil, Petroleum Products	BP Pipelines North America, Inc.	4 acres

Source: Port of Long Beach, 2006 Facilities Guide.

Port of Hueneme - The Port of Hueneme is 60 miles north of Los Angeles in Ventura County. The Port of Hueneme handled over one million MRT of cargo in 2003. As shown in Table 20, the port's principal commodities include automobiles, bananas, wood pulp, fresh fruit, general cargo, offshore oil support, and fish.

Table 20
Port of Hueneme Cargo Volumes 2002 and 2003
(Metric Revenue Tons)

Cargo Type	2002	2003
Automobiles	235,102	219,170
Bananas	395,157	434,092
Wood Pulp	39,200	35,500
Fresh Fruit	116,929	144,506
General Cargo	98,050	159,354
Offshore Oil	79,763	88,689
Fish	23,660	14,177
Total	**987,861**	**1,095,488**

Source: Port of Hueneme, *Naval Base Ventura County: Strategic Commercial Development Plan*, December 1, 2003

Handling over 219,000 MRT of automobiles, the Port of Hueneme is one of the load centers for the import and export of automobiles. It currently imports well-known brands such as BMW, Mini Cooper, Rolls Royce, Jaguar, Land Rover, Mazda, Mitsubishi, Saab, Suzuki, and Volvo. In contrast, POLA handled 884,000 MRT of motor vehicles in FY 2004, and the POLB handled 438,000 MRT of motor vehicles in CY 2004.

The infrastructure at the Port of Hueneme includes two commercial wharves:

- **Wharf 1 -** Three berths totaling 1,800 linear feet with a depth of 35 feet are located at the south side of Channel "A" and adjacent to the inner end of the entrance channel. Wharf 1 serves general cargo, fresh fruit, and vegetables. In addition, vessel fueling and liquid bulk operations are performed at Wharf 1.
- **Wharf 2 -** Two berths totaling 1,450 linear feet with a depth of 35 feet are located at the north side of Channel "A." Wharf 2 serves heavy equipment shipments, automobiles, wood pulp, and general cargo. Support vessels used in local offshore oil industry also use both wharves for mooring and supply operations.

On Wharf 1, there are two on-dock refrigerated facilities that support palletized agricultural imports and exports. Del Monte, LauritzenCool, Sunkist, and the Noboa Group (the largest banana producer in Ecuador) all have facilities at the Port of Hueneme. In addition, Hydro-Agri operates a three-acre bulk liquid fertilizer terminal on the South Terminal of the Port of Hueneme. The port serves Aracruz Cellulose in importing wood pulp. The port also handles a wide variety of project cargoes.

The Oxnard Harbor District is also the grantee for U.S. Foreign Trade Zone (FTZ) #205, which handled over one billion dollars in cargo value in 2002. FTZ #205 is the first zone established along the California Central Coast. The FTZs are secure areas that are physically within the U.S., but are considered outside of U.S. Customs. The Board of Harbor Commissioners of the City of Los Angeles is the grantee for FTZ # 202. The Board of Harbor Commissioners of the Port of Long Beach is the grantee for FTZ # 50 Long Beach.

Overview of Containerized Trade

Container traffic is a critical issue for this study, because of its magnitude, rapid growth, and its impact on the study area.

In CY 2005, the San Pedro Bay ports handled 14.2 million TEUs of containerized cargo, accounting for 34 percent of U.S. containerized trade (43 percent of imports and 23 percent of exports), handling an average of about 39,000 TEUs a day. Combined they represent the largest port complex in the United States and the fifth largest in the world. Table 21 shows the top ports (in container throughput) in North America and the world in 2005. Total U.S. containerized trade in CY 2005 was 41.96 million TEUs.

Table 21
2005 Top Ports in North America and the World (millions of TEUs Annually)

Top North American Ports		Top World Ports	
Port	**TEUs**	**Port**	**TEUs**
1. **Los Angeles**	7.48	1. Singapore	23.19
2. **Long Beach**	6.71	2. Hong Kong	22.43
3. NY/NJ	4.79	3. Shanghai	18.08
4. Oakland	2.27	4. Shenzhen	16.20
5. Seattle	2.09	**Los Angeles/Long Beach Combined**	14.19
6. Tacoma	2.07	5. Busan	11.84
7. Charleston	1.99	6. Kaohsiung	9.47
8. Hampton Roads	1.98	7. Rotterdam	9.30
9. Savannah	1.90	8. **Los Angeles**	7.48
10. Vancouver	1.77	9. Hamburg	8.05
11. San Juan	1.73	10. Dubai	7.62
12. Houston	1.58	11. **Long Beach**	6.71
13. Montreal	1.26	12. Antwerp	6.49

Source: Containerization International and North American Port Container Traffic, American Association of Port Authorities, 2005

As shown in Table 22, containerized traffic through the POLA and POLB has grown dramatically over the last two decades, fueled in part by the phenomenal rise of China as a manufacturing and export center. Between 1985 and 2005, container throughput grew by a factor of 6.32, or at an average compound annual rate of 9.7 percent.

Table 22
Growth in Containerized Cargo at the San Pedro Bay Ports, CY 1985 - 2005
(1000s of TEUs Annually)

Year	Los Angeles	Long Beach	Total
1985	1,104	1,141	2,245
1986	1,330	1,394	2,724
1987	1,580	1,460	3,040
1988	1,652	1,540	3,192
1989	2,057	1,575	3,632
1990	2,116	1,598	3,714
1991	2,039	1,768	3,807
1992	2,289	1,829	4,118
1993	2,319	2,079	4,398
1994	2,519	2,574	5,093
1995	2,555	2,844	5,399
1996	2,683	3,067	5,750
1997	2,960	3,505	6,465
1998	3,378	4,098	7,476
1999	3,829	4,408	8,237
2000	4,879	4,601	9,480
2001	5,184	4,463	9,647
2002	6,106	4,524	10,630
2003	7,179	4,658	11,837
2004	7,321	5,779	13,100
2005	7,484	6,710	14,194

Source: US/Canada Container Traffic in TEUs; American Association of Port Authorities, 2005

There is a significant imbalance in the direction of containerized trade. As shown in Table 23, imports dominate exports by a significant margin. In CY 2005, loaded imports accounted for 75 percent of all loaded containers. In addition to the fact that exports are the lesser volume, a large share of the exported containers is empty. While only accounting for approximately a third of all TEUs, nearly two-thirds of container exports are empty.

Table 23
Loads and Empties by Direction, San Pedro Bay Ports, 2005
(1000s of TEUs Annually)

	Port of Los Angeles	Port of Long Beach	Total
Imports (Inbound)			
Loads	3,881	3,346	7,227
Empties	75	134	209
Total	3,956	3,480	7,436
% Empty	1.9%	3.8%	2.8%
Exports (Outbound)			
Loads	1,171	1,221	2,392
Empties	2,357	2,009	4,366
Total	3,528	3,230	6,758
% Empty	66.8%	62.2%	64.6%
Imports + Exports			
Loads	5,052	4,567	9,619
Empties	2,432	2,142	4,574
Total	7,484	6,710	14,194
% Empty	32.5%	31.9%	32.2%

Sources: Port of Los Angeles; Port of Long Beach

This section of the report summarizes how the modal system works as a whole and its role in integration across supply chains. It is intended to provide insight into the system's progress toward improving efficiencies and lowering costs through integration.

3.1 OVERVIEW OF THE SUPPLY CHAIN

In 2005 the nation's business logistics costs were $1,183 billion. This is an increase from 8.8% in 2004 to 9.5% of our nominal Gross Domestic Product in 2005. This is an increase of $156 billion over 2004. Domestic freight transportation grew 20% during the last decade.

A supply chain, logistics network, or supply network is a coordinated system of organizations, people, activities, information and resources involved in moving a product or service in a physical or virtual manner from supplier to customer. The entities of a supply chain typically consist of manufacturers, service providers, distributors, sales channels (e.g. retail, ecommerce) and consumers (end customers). Supply chain activities transform raw materials and components into a finished product that is delivered to the end customer. There are a variety of business models that address the upstream and downstream sides of making a product and delivering it to market.

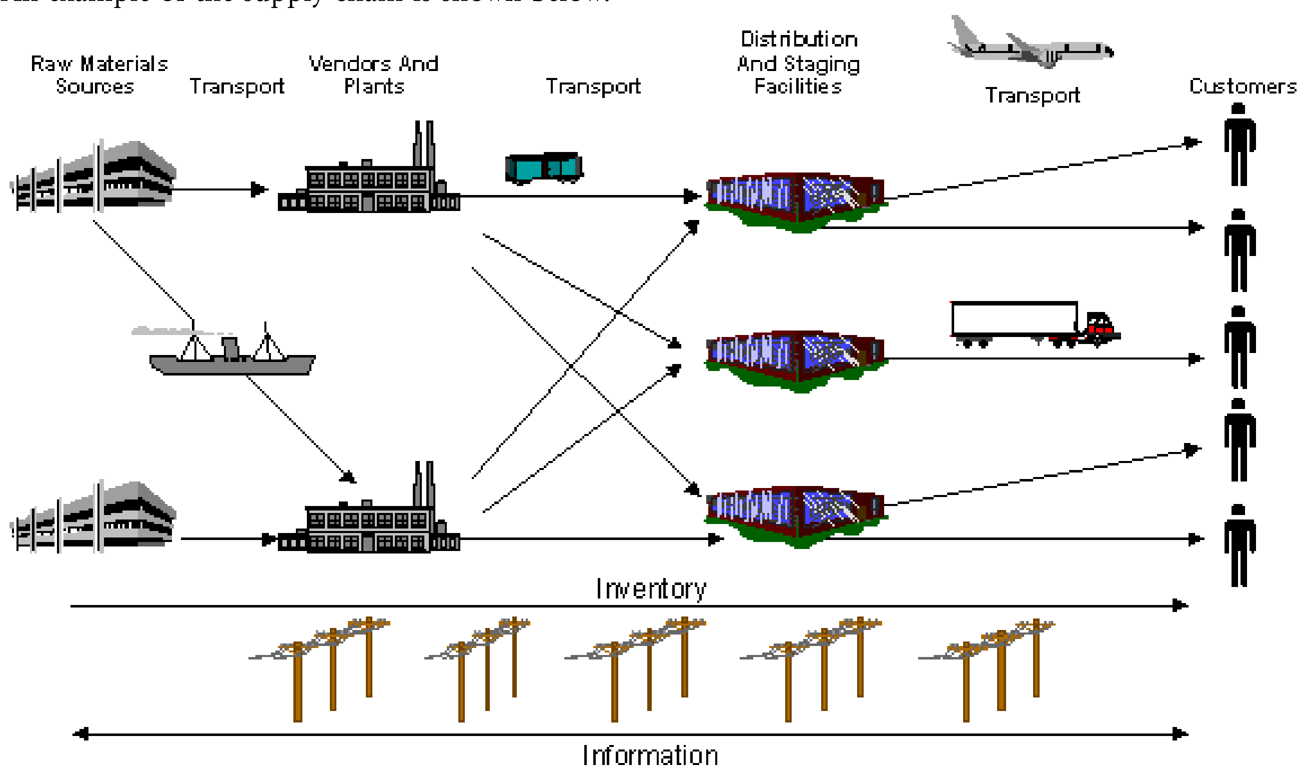
The primary objective of supply chain management is to fulfill customer demands through the most efficient use of resources, including distribution capacity, inventory and labor. Supply chains vary by industry and product. Generally, supply chains can be grouped into the following six (6) categories:

1. Extraction Industry: This would include forest products, grain and coal shipment. The needs of this set of supply chain users include low unit transportation costs and high-asset utilization.
2. Manufacturing Industry: This group of users would be characterized by companies who run continuous process manufacturing facilities. They typically have few sites and have highly specialized equipment. Chemical and plastic companies typify this supply chain category. The needs of this group of users include low unit cost transportation and a high degree of service reliability.
3. Make to Stock Industry: This user group typically has many sites, a complex set of inbound and outbound product flows and uses roughly equal parts of labor and machinery. Industry examples may include lumber and paper shippers, auto assembly plants and heavy machinery manufacturers. Supply chain requirements include consistent and reliable service.
4. Make to Order Industry: Supply chains for this industry group are typified by few sites with limited flows of inbound and outbound materials. This group is technologically advanced. Examples might include airplane manufactures or the defense industry. Supply chain needs include reliability of service and speed of delivery.
5. Distribution Industry: This group has many nodes, lots of transactions and product flows in various quantities. Many shipments are small and rely on the use of a number of vehicles. Examples in this category include small package carriers, specialty electronics and

after market parts distributors. Supply chain needs include predictability and reliability of service.

6. Retailing Industry: This includes all retail sales products. There are a large number of shipping destinations and product flows in various quantities both inbound and outbound. There are many sophisticated risk management strategies in place to assure a highly reliable supply chain. Products are often shipped and inventoried based on supply chain velocity. These supply chains tend to be the longest and most far reaching. Some retailers require vendors of fast moving or high cost products to stock product in end cap displays. This group drives transportation flexibility, agility and the ability to respond to forecast changes quickly. Examples include computer makers, discount retailers and grocery stores. Supply chain needs include velocity and flexibility of service.

An example of the supply chain is shown below:



Supply chain visibility is the top concern of most companies involved in global supply chain activities because of the long lead times required between the time an order is placed and the time it lands on U.S. soil. Forecasts are critical, yet the longer the forecast is out from the actual date of consumption the greater the variability. With the goal of end-to-end supply chain visibility in reality today nearly seventy five percent of firms lack enterprise automation for the entire process.

Companies typically track the following shipping events:

- Order acknowledgement matches purchase order
- Raw material arrival at supplier

- Projected production plans
- Supplier production process events
- Advanced shipment notice matches purchase order
- Carrier pick-up of goods
- Customs clearance
- In-transit status at the shipment level of detail
- In-transit status at the order level of detail
- Electronic proof of delivery

From the typical shipper's perspective, lowering transportation costs and improving reliability across the supply is a critical and constant focus. Significant investments in processes, technologies, and assets have made the supply chain as a whole increasingly productive and cost-efficient. Evidence of this lies in the fact that the cost of logistics as a share of Gross Domestic Product (GDP) have been cut in half over the past two decades, from 16.2 percent to 8.7 percent.[1] Logistics costs include inventory carrying costs, administrative costs, transportation costs, and information costs associated with customer service.

However, while both transportation and inventory costs have dropped as a share of GDP, inventory costs have dropped at a significantly higher rate. As a result, transportation costs as a share of total logistics costs have actually increased from around 45 percent to 63 percent over the past two decades.[2] Therefore, transportation costs are the largest "target" in terms of further lowering overall logistics costs.

The Aberdeen Group has benchmarked global supply chain trends for more than 20,000 enterprises. In their work they have found that large companies' international supply chains are only 50% as automated as their domestic supply chains. Eight-seven percent of the large enterprises and 64% of all respondents say their company's staffing for managing global supply chain and trade compliance process is inadequate. More than 82% of companies are concerned about supply chain resiliency to disruptions, but only 11% are actively managing this risk. Nine out of ten companies reported to the Aberdeen Group that their global supply chain technology was inadequate to provide corporate finance with the timely information it requires. Top areas of budget discrepancy include transportation expense, raw materials, supplier changes, taxes and tariffs, fees, inventory costs and network service cost.

3.2 INTEGRATION ACROSS THE SUPPLY CHAIN

The MCGMAP study area has the largest goods movement system in North America. However, each mode operates largely as an independent entity. As a result, the modes are not organized at a level that easily permits integration across the entire supply chain.

While the goods themselves move from mode to mode, the carriers and service providers typically do not have the ability to influence the reliability and quality of service of the entire supply chain. Carriers, as explained below, do not typically venture into total logistics services and, if they do, it is generally to gain pricing control and competitive advantage rather than to make door-to-door supply chain improvements.[3]

The following is a discussion of how the carriers and modes work within the overall system, and their role in overall supply chain integration.

Ocean Carriers

Ocean carriers are a major influence on the system, since they carry ocean freight the longest distance and have the freight in their custody for the longest time period. Carriers have partnered with each other to provide more frequent departures and deliveries to popular markets. Ocean carriers provide multiple pricing offerings; some bundle ocean transportation with land side deliveries.

This is done in one of three ways:

- **Inland-point Intermodal Service -** The ocean carrier arranges transfer of marine container from vessel to rail and rail line haul movement, all under one rate.
- **Transportation to the Port Gate with a Container Mounted on a Chassis -** The customer separately arranges for a marine container to be transported from port gate to destination distribution center via long-haul truck or dray.
- **Transportation to Inland Warehouses -** Dray from port gate to warehouse may be arranged by line or by customer. The customer contracts with a Third Party Logistics (3PL) firm, sometimes a subsidiary of the ocean carrier or the Non-Vessel Owning Common Carriers (NVOCC), to provide deconsolidation and transloading into domestic trailers or containers.

These examples are not attempts at managing the supply chain as whole. Instead, they are measures implemented to maintain or gain market share. While some ocean carriers have in the past offered landside transport in an effort to differentiate themselves from their competitors, the synergies between shipping line and inland operations are not strong. Managing inland market areas, container balance and a chassis fleet is a large task for an offshore transportation company. Ocean carriers rarely make money on the land component, and are known to subsidize some inland segments in an effort to land accounts. Total door-to-door supply chain management and integration is not a top priority for ocean carriers. In fact, there is a desire to return to basic port-to-port offerings, and to aggressively price any activities that are not within the line's control.[4]

Railroads

The main market emphasis for the railroads in the study area is the intermodal business, including container traffic through the ports. The railroads wholesale their intermodal train capacity directly to the marine lines or rely on third party intermodal marketers for the domestic and transload business segments. The railroads are focused on managing their intermodal yards and the shipping lanes they operate. The drayage part of the business (pick-up and delivery of containers to and from the terminal) is typically arranged by the intermodal marketing companies. An intermodal shipment consists of several trip segments (or legs). The line-haul is the long haul rail portion of the trip between the originating and terminating intermodal yards. On either end of the line-haul is the local dray to and from the actual shipper or receiver of the goods.

Trucking

The truck mode plays a significant role in moving goods door-to-door between shippers and receivers, as well as transferring goods from one mode to another (for example, between a port and an intermodal yard). It has the greatest ability to provide fully integrated door-to-door service, but only for shipments that stay within the mode (or carrier). However, this is rarely the case for line-haul segments on other modes such as rail intermodal. As trucking costs increase and as drivers are becoming increasingly hard to find, more motor carriers are using intermodal as a line haul substitute in long haul corridors. The railroads are encouraging the truckers to bring their trailers and assets to the intermodal industry. Trucking companies historically have had the most responsive and informed customer service associates. This combination of great customer service with lower cost long haul and line haul service is developing into a broad based partnership for many former competitors.

Air Cargo Industry

Air cargo is the only example where cargo movements are controlled as part of an integrated supply chain system. The major air cargo and express companies are referred to as integrated carriers for that reason. The service they provide is essentially integrated and controlled door-to-door. The leaders in this arena manage the whole process by owning the ground transport operations as well as the air lift capacity, exercising control through ownership (for example FedEx and UPS). Air cargo and express providers use current technology to exercise control□bar codes, hand-held scanners, global positioning systems (GPS), and mobile communications. Those integrated carriers that do not own ground or air lift capacity outsource the capacity to a specialist. Nonetheless, they still exercise door-to-door control by using information technology to integrate across the entire chain. The air cargo industry companies work with partners to ensure compatibility of information systems. Because of the type of service this industry provides (time-definite reliability at a premium price), it is a prerequisite to integrate across the entire chain. Their pricing structure can afford a more complicated system that cuts across the supply chain.

Shippers

Shippers tend to focus on their core competencies and outsource transportation elements of their operations. Sometimes this is done to gain access to lower cost transportation rates, through volume purchasing efforts of the 3PL. Sometimes this is done to purchase customs expertise and other trade-related documentation preparation. However, some top tier retail chains (such as Wal-Mart and Target) and major industries (such as aviation and automotive manufacturers) exercise more control over their specific supply chains. They tend to own private truck fleets, operate private warehouse distribution systems and exercise more influence over service levels and performance. However, this level of influence is isolated to a few top tier companies. For the most part, shippers buy the most affordable and reliable transport service and rely on the service providers to ensure the delivery is made. On the receiving end, safe and on-time delivery matters more than how the shipment got delivered. While shippers and receivers use information technology to track the status of their goods, they have limited ability to exercise control over the supply chain (with the exception of the top tier firms).

Goods movement in the study area is becoming more internationalized as shippers globalize their supply chains by partnering with and/or taking ownership of overseas resources. This has not led to modal integration, however, because while customers (the shippers) are participating in globalization, modal operators in the study area are generally not doing so. Network isolation is a prime reason for this. Carriers tend to focus on their specific networks, which are generally geographically constrained. For example, U.S. rail carriers focus primarily on their domestic rail networks and services, and limit overseas efforts to marketing and sales. The same is true for motor carriers. In addition, network ownership becomes more complex as it crosses international boundaries. Carriers and service providers generally have not internationalized operations, and internationalization has not resulted in supply chain integration across the modes.

Third Party Logistics Providers

Another key component in the study area is the 3PL provider. Shippers that use 3PLs rely on them to make a large portion of the decisions around shipments such as mode choice, routing, transit times, pricing, staging, etc. However, 3PLs are largely non-asset based and therefore primarily control the information management and carrier monitoring aspects of the supply chain operations. Many shippers tend to rely on more than one 3PL service provider to manage different aspects of their supply chains. For example, one 3PL may manage purchased transportation while another may be a freight payment or warehousing expert.

Technology in the Supply Chain

The ability to monitor, manage, and deliver reliable service from shipper to receiver is at the heart of supply chain optimization. Given that the study area's modal system does not function as an integrated whole, the overwhelming method of control is through information sharing, management, and technology innovations. Technology and information are used to unite systems and to maintain synergy. Service control systems in the study area and elsewhere are built around computers, databases, enterprise resource planning (ERP) and supply chain management (SCM) software and tools, bar codes, hand-held scanners, GPS, and mobile communications. Shippers and receivers use data and technology to track shipments, and to monitor the flow, cost, and routing of shipments in conjunction with production schedules, inventory levels, replenishment strategies, and sales.

However, each shipper or receiver relies on current technology and data to serve their goals. These types of approaches tend to stay within the modes and the service providers. The level of data and information shared is specific to the respective user's goals and objectives. Devices and techniques that function across all the modes are relatively new and these systems are often proprietary.

Coordinated Logistics

As recently as three decades ago, the concept of "total logistics" management emerged as "a holistic approach" to designing physical supply and distribution programs. Shippers, it was reasoned, could improve the efficiency and effectiveness of their networks by making internal trade-offs between faster and more reliable transportation alternatives and lower inventory levels."[5] From the shippers' perspective, total logistics management is the ultimate approach for achieving the cost savings and efficiencies they strive for. Because of the limited modal integration that has occurred in the industry to date, shippers are getting "coordinated logistics" at best. With the rapid evolution of information technology over this period, the modes have achieved significant efficiencies, specifically by exploring cross-modal operations. For example, some of the truck load carriers in the motor carrier industry have developed service alliances with the rail intermodal carriers in order to substitute some truck load capacity with line-haul rail capacity. However, the purpose and goal is not to achieve across-the-board supply chain integration, but rather to gain pricing advantages and to gain better asset utilization. These carriers focus their own truck assets on the routes that give them the best returns, and use the rail intermodal line haul services on the lower-yielding, price-competitive long-haul lanes.

The benefit to shippers is that in addition to lower shipping costs, they receive a certain degree of coordinated logistics. By utilizing a cross-modal approach to improve its services for the shipper, the trucking carrier must coordinate with the line-haul rail intermodal carrier to ensure a quality level of service. For example, the motor carrier will need to arrange for a dray company to pick up and deliver the shipment at the other end of the line-haul.

3.3 MEASURING THE PERFORMANCE OF THE INTERMODAL SYSTEM

It has been said that you cannot manage what you cannot measure. The performance of the supply chain as a whole depends on the performance of each mode within the system. The supply chain is only as strong or reliable as the weakest link. The supply chain is adversely affected when throughput and productivity decline at the intermodal and port terminals or when speeds along the line-haul segments decline. Despite these realities, the performance of the supply chain as a whole is not monitored by the public infrastructure providers (federal, state, and local transportation agencies).

Performance Optimization within the Modes

While the study area's intermodal system is essentially not integrated, the operators with each mode typically have a set of performance measures that they monitor. The following are examples of existing performance rates or performance targets in various components of the supply chain.

Common Performance Measures at Marine Terminals:

- Terminal Productivity (average performance at POLA and POLB in CY 2005) – 4,700 TEUs per acre per year[6]
- Container Dwell Times[7] (limits imposed on shippers):
    - Imports – four days
    - Exports – six days
- Container Drayage Trip Time (average performance) – 4.6 hours[8]
    - Total Truck Turn Time[9] at Port – 2.6 hours[10] (2-3 hours)[11]
        - 48 percent of local dray trip is spent waiting to get in and out of the port[12]
        - AB 2650[13] (performance target) – 30 minutes[14]
        - In Terminal Time to Load/Unload – 35 minutes[15]
    - Drive time – 2 hours[16]

Common Performance Measures at Intermodal Rail Terminals:

- Container Dwell Times (performance targets):
    - Inbound – within 24 hours[17]
    - Outbound – within 24 hours[18]
    - Service Disruptions – two to three days[19]
- In Terminal Truck Turn Times (average performance) – 15-30 minutes[20]
- Total Truck Turn Time (average performance) – 30-40 minutes[21]
- Land Bridge Transit Times (average performance):[22]
    - Los Angeles/Long Beach to Chicago – five to seven days[23]
    - Los Angeles/Long Beach to New York – seven to nine days

Common Performance Measures at Distribution Centers and Warehouses:

- Inventory Dwell Times[24] (average performance):
    - Good – 12 plus turns per year
    - Average – seven to eight turns per year
- In Terminal Truck Turn Times[25](average performance):
    - Palletized/Stretched Wrapped – 45-60 minutes[26]
    - Loose Cartons/Floor Loaded (500 to <900 cartons): 1.5-2 hours
    - Loose Cartons/Floor Loaded (>1000 cartons): 3.5-4.5 hours
- Total Truck Turn Time – same as internal turns[27]

Lack of Industry Standards for Performance

The previously listed industry performance summaries are essentially the range within which they typically perform. These are not necessarily industry-wide standards. The absence of standards obviously presents a challenge for improving the modal system's performance. Moreover, without a base performance target, there is no effective means of estimating delay across the supply chain.

The Importance of Performance Measures

Performance measures are important for:

- Setting targets or goals for increased throughput, reliability and velocity.
- Communicating performance to their customers.
- Measuring impacts on the economy and the environment.
- Providing public and private investors in the system information needed to justify infrastructure or operational improvements.

For example, the POLA and POLB recently developed new capacity estimates for 2030 based on expected increases in acreage and productivity. To achieve the estimated capacity of 42.5 million TEUs in 2030, the port container terminals will have to increase their average productivity from 4,700 TEUs per acre per year to over 10,000 TEUs per acre per year. This can be accomplished by a combination of technology (optical character recognition readers at all gates and RFID tags on all trucks), 24-hour operations, reduced free time, grounded operations (stacked containers instead of wheeled operations), modified labor rules (allowing trains to move into terminals while trains on adjacent tracks are being loaded or unloaded), spreading out vessel sailings more evenly over the week, chassis pools, universal appointment systems, and other operating practices. It is not possible to precisely break down the contribution of each strategy to improved terminal productivity. Better planning, coordination, and communication among the shipping lines, terminal operators, trucking companies, and railroads will help. One promising example of better coordination is the proposed BNSF On-Dock Business Exchange, a web-based planning tool that provides a seven-day advanced notice to the railroads of the number of containers to be imported at each terminal and by destination. This would greatly improve the railroad's planning for rail equipment and reduce unnecessary delays to shipments.

System Performance Monitoring

While individual modal performance may be monitored, there are limited instances where technology and information is used as a tool to monitor the performance of the entire modal system. While shippers and receivers do not generally monitor the performance of the system as a whole, they do track the performance of their own specific supply chain. Therefore, they have good data about their specific shipments, including location, volume, type, and other information they need to make decisions about the allocation of their inventory and stock. Carriers typically track data on the operational aspects of the system; i.e., where the bottlenecks and delays are, what the average speeds are, the velocity of the system, and then allocate assets (trucks, chassis, container slots, etc.).

Systematic intermodal performance is important to intermodal marketing companies and 3PLs, and they tend to know the strengths and weaknesses of each carrier in the network. Customers evaluate these intermediaries on their transportation network savvy and ability to meet shipper specified performance standards. An example is the practice of taking full advantage of free storage time at a marine terminal that may benefit their customer (by saving storage costs and by providing flexibility in the supply chain). However, on a macro basis, this practice undermines the terminal's capacity. Boxes and containers stored on terminal take up valuable space. In general, ports and terminal operators that need more capacity try to reduce average storage time (or dwell time). In fact, the Ports of Los Angeles and Long Beach recently reduced the free time for imports from five days to four days. Reducing this buffer puts additional pressure on freight forwarders, Customs brokers and transport carriers. In the past supply chains were managed to meet standard delivery times. With a reduction in buffer times between mode changes, carrier on-time performance becomes more critical. If scarce trucking resources are going to be dispatched against an expected vessel or carrier arrival and the load is not ready for pick up – for a customs hold, for example – the driver is set up for dry run, which creates extra truck trips in many cases.

Carriers use information and technology to manage assets, gain pricing advantage, and to improve operational efficiencies. Marine terminal operators use sophisticated terminal operating systems (TOS) to coordinate all facility operations, equipment assignments, vessel and train service, and gate functions, or position detection systems (PDS) that monitor and manage the location of containers. The marine terminal operator's core focus is on terminal performance and not the overall system's performance. For example, truck queue times at marine terminals are typically not factored into the turn time performance measures used by terminals. These measures focus only on the time trucks are in the yard and ignore queue times outside the gate. As shown by the performance data presented earlier in this section, approximately half of the time it takes for a truck to make a local delivery is spent at the port either waiting, loading, or unloading. Approximately one quarter of this wait time is monitored and reflected in the truck turn measure used by the terminals. The rest of the wait time is not monitored or managed. This is another example in which performance, while monitored and managed, is focused internally and not system-wide.

The local trucking industry is beginning to deploy GPS-based technologies to help improve trucker efficiencies and operations.[28] The carriers will be able to identify information about shipments and the location of trucks, and drivers can receive changed instructions in transit. These technology deployments are an effort to improve the efficiency and competitiveness of the trucking operators themselves – to provide a better product or service to their customers in order to sustain and/or grow market share – as opposed to improving the efficiency of the overall supply chain.

Because so much of the information needed for an overall system performance measurement is held by private companies, it is nearly impossible to create an integrated generic performance guideline. Instead, in today's highly competitive logistics industry, companies compete with their supply chains. In this environment each carrier makes the best effort to optimize and market its own performance in an effort to secure customers and gain competitive advantage. System-wide performance measures would likely help to identify opportunities for improving the system's performance, but given private industries' competitive structure, industry collaboration on transportation performance data is unlikely.

This section identifies the existing constraints, issues, and problems facing the movement of goods in the study area. The forecast assessment will be conducted in Task 4 - Assessment of Future Freight Demand, and any constraints, issues, and problems stemming from the forecasts of future conditions will be presented in the Task 4 technical memorandum. An evaluation of alternative strategies to address these concerns will be conducted in Tasks 6 and 7.

The section is organized around the following topics:

- Community concerns about air quality, congestion, and land use
- Port and airport capacity and throughput
- Highway congestion and delay
- Truck access and turnaround at facilities
- Mainline rail capacity
- Rail intermodal yard capacity
- Grade crossings (delay and safety)
- Highway safety and truck accidents
- Security
- Availability of funding
- Changes in regional shipping and transfer modes
- Migration of land uses and development
- System-wide goods movement data and information
- The disparate nature of the goods movement system.

This section includes a limited discussion of the impact of goods movement on the environment and the economy. These key impacts will be addressed in more detail as part of Task 5 - Evaluate the Community, Environmental, and Economic Impacts of Freight Movement Generators and Facilities.

4.1 COMMUNITY CONCERNS ABOUT AIR QUALITY, CONGESTION, AND LAND USE

A significant constraint on the existing goods movement system is community and political concern about air quality, congestion and land use. These concerns can slow the development and expansion of significant goods movement projects. It is well documented that goods movement is a major contributor to air quality degradation in the air basin, particularly with regard to diesel emissions, and has contributed to the region's inability to attain ambient air quality standards.

Over time, the focus on types of impacts associated with air pollution has changed. For much of the 20th century, concerns were generally about the visual impacts -- the Los Angeles area has a reputation as the smog capital of the nation. In recent years, as the visual nature of air pollution was reduced, public concern shifted to the health effects associated with various pollutants. While the environmental regulatory framework has always focused on the health-based standards, the availability of new scientific knowledge on previously unregulated and largely unstudied emissions such as ultra-fine particles from diesel emissions has increased the focus on health effects. Research conducted by the Keck School of Medicine at USC indicates that the combination of gases and fine particles in transportation exhaust (especially diesel fuels) affects lung function and contributes to arterial thickening, birth defects, and low birth weights. Data also indicate that the closer one lives to pollution sources (e.g., the ports, intermodal yards, or major transportation arteries), the higher the risk. As examples, the increased incidences of cancer and of asthma in children are shown to be affected by proximity to pollution sources. The widespread dissemination of this information in the media has raised awareness of these issues and increased concern within affected neighborhoods.

The following examples of impacts demonstrate the implications of not addressing community concerns.

Port Development

The MCGMAP study area ports face their biggest constraint in community concern over the health impacts of continued port growth. The primary concern is diesel emissions, a known carcinogen, although noise and aesthetics are also problems for the communities. Community concern has grown as the movement of freight through the ports has grown, with increased operation of trucks, trains, and ocean vessels.

As a result, community and environmental groups have forced a significant slowdown in port development in recent years. The proposed Pier J expansion was halted after concerns were raised about the environmental document for that project. At the POLA, improvements to the China Shipping Terminal were significantly delayed because of a lawsuit brought against the POLA by the Natural Resources Defense Council (NRDC). This litigation resulted in a $50 million settlement, which included mitigations for emissions impacts.

The community concerns about pollution do not just impact future port development. The concerns are also about the ports' current operations. Community pressure is instrumental in the ports' effort to reduce emissions of current operations. The ports have responded to these environmental concerns. To address air quality problems, the POLA and POLB recently released a joint Clean Air Action Plan (CAAP) to expand upon existing emission reduction strategies, such as Alternative Maritime Power (AMP) and Vessel Speed Reduction (VSPR), and develop new emissions reductions strategies, such as increased use of alternative fuels. The plan focuses primarily on two main goals, (1) to reduce port-related air emissions in the interest of public health, and (2) to disconnect cargo growth with emissions increases.

At the Port of Hueneme, community and political opposition to the proposed expansion into the adjacent naval base has grown. With its "Strategic Commercial Development Plan," the port hopes to acquire 677 acres of Navy land (out of a total 1,600 acres) to accommodate growing demand, particularly for automobile imports and automobile processing. The port asserts this can be done without jeopardizing the Navy's mission and without impacting Navy-related civilian and military employment. Another recent conflict near the port has been a proposal for new housing along Hueneme Road, which is the principal truck route to the Port of Hueneme. The California Coastal

Commission approved the new housing project, but in the long term this development could make it harder for the port to realize its growth objectives.

Highway Capacity Expansion

A well-documented example of community concerns with a goods movement-related highway project is the planned expansion of I-710 (toward the ports). Communities rose up in opposition to the original plans for the expansion of I-710, primarily because of the anticipated displacement of residents' homes along the proposed alignment. In 2005, however, consensus was reached by all I-710 corridor cities, the Gateway Cities Council of Governments and Metro on a hybrid alternative that minimized right-of-way impacts. Still, concerns over the health impacts of diesel emissions threaten the viability of the I-710 improvements and all other goods movement projects. This is an important commuter corridor and an important connection between the San Pedro Bay ports and points inland. Its expansion has been identified as an important step toward accommodating present and future levels of passenger and truck traffic.

The I-710 is an example of how community concerns and local participation have required a more comprehensive approach to infrastructure development. Under the leadership of Metro, the Gateway Cities Council of Governments, and Caltrans, the I-710 Corridor Project is proceeding at a pace at which the community can analyze and influence the decisions made. There is general consensus that improvements are needed to the primary truck and commuter corridor from the ports to distribution yards and other east-west corridors. If the project does not proceed there will be further denigration of air quality and decreased safety as port-related truck traffic increases on an outmoded freeway.

In order to achieve the expansion of this corridor, as well as any other major goods movement corridors, including improvements in highway truck capacity east of Los Angeles, the community's environmental and health concerns must be addressed.

Warehouse Expansion

Another critical issue is the migration of warehousing and distribution to the eastern reaches of the study area (see 4.12 Migration of Land Uses and Development). The addition of warehousing and distribution facilities throughout the Inland Empire[1] and the increase in truck traffic east of downtown Los Angeles (on freeways and city streets) has triggered community concern about safety, noise, congestion, and intrusion of truck traffic near homes and schools. Communities and economic development agencies are all looking for new employers and growth opportunities which will lead to more jobs. Zoning and land use policies are determined by the city, or county depending on the local governance. Conflict arises when inland areas, hoping to attract and land "Big Box" retailers and distribution centers offer incentives and packages for new development. This development often is done with careful consideration for local access, curb, gutter and utility costs, but often without consideration for the multi-jurisdictional nature of the freight and highway networks that connect the new site with the global supply chain. Many areas of the country are experiencing these same conflicts, where the pursuit of new jobs often comes with many unanswered freight network infrastructure and capacity questions.

There is also a growing conflict between land available for warehouse development and other uses. Industrial and residential real estate developers are competing for the same land. Residential developers in many areas are driving up the price of land, making it costly to locate warehouse and distribution facilities. In areas where there is a rapid growth in warehouses, the increased demand for warehouse workers has pushed costs up and encouraged employee turnover, which is a serious problem for warehouse operations. Labor is an important consideration for new logistics facilities.

Air Cargo Expansion

Airport development is accompanied by a number of uncertainties, including strong community opposition, environmental concerns, and state regulations. For example, there are a number of specific issues related to the proposed modernization of LAX, including its effects on air quality, noise, and traffic.

The idea of locating cargo capacity at other airports has long been discussed and studied and has met with challenges, including:

Expansion at Palmdale Regional Airport - The 2004 SCAG RTP Regional Aviation Plan proposes a new master plan for PMD that could play a significant role in the ways airports and airlines do business today. Many of the proposed changes would require modifications in federal regulations regarding the ways airports can set fees and spend money.

Expansion at Ontario International Airport - ONT has limited international facilities and faces air-quality constraints, limiting it as an option if LAX makes passenger and cargo trade-offs or limits operations**.** To relieve pressures at LAX, the California Air Resources Board (CARB) would need to relax its air quality ceiling at ONT. Congestion stemming from the lack of ground facilities threatens domestic and international trade moving through the region and the quality of life for people who live there. Again, in order to expand air cargo capacity as well as passenger capacity, the community and environmental concerns must be addressed, regardless of the location of such expansions.

Rail Expansion

In addition to its impact on ports, highways, and airports, community concern also affects the expansion of rail capacity. The BNSF is working with the POLA to develop the Southern California International Gateway (SCIG), scheduled to open in 2009. BNSF estimates that the lift volume will be between 1.0 million and 1.5 million container units annually. The project is intended to move the international containers now handled at the Hobart facility to SCIG.

The project is in the early stages of development, currently focused on activities surrounding the completion of an Environmental Impact Report (EIR). There are unique environmental proposals for this project, such as BNSF's willingness to use "green" technology and a proposed reduction in truck vehicle miles. "Green" technology would include electric cranes, liquid petroleum gas (LPG) fueled hostling trucks and hybrid switch engines, while a reduction in truck vehicle miles would lower congestion and emissions. However, communities around the selected site, including the Cities of Los Angeles, Long Beach, and Carson, have raised concern about the increase of truck traffic on the local roadways and intrusion on the neighborhoods and schools.

If the project does not move forward, it will further exacerbate the shortage in intermodal lift capacity and will increase truck vehicle miles traveled, congestion, and emissions, especially since the existing Hobart facility is further from the ports. It will also diminish the likelihood of other similar projects such as the UP's plans to expand ICTF's capacity from 800,000 units to 1.65 million annually. UP is in the early stages of formulating an EIR document for this expansion. UP also plans to increase the capacity of the City of Industry intermodal facility from approximately 300,000 to 650,000 units annually. This facility will be used to support domestic intermodal operations.

4.2 PORT AND AIRPORT CAPACITY AND THROUGHPUT

In addition to community concerns about the environment, there are physical and operational elements that impact the existing capacity and throughput at the ports and airports.

Container Terminal Throughput Capacity

Terminal capacity is a function of several physical factors, including the number and length of berths, terminal acreage, and the availability of equipment (e.g., cranes). In addition, there are operational aspects such as container stacking and storage practices, container dwell time, hours of service, technology (e.g., information systems, optical character recognition systems, RFID), and labor productivity, all of which effectively increase throughput without necessarily requiring physical expansion.

The POLA and POLB recently developed new capacity estimates for 2030 based on expected increases in acreage and productivity. To achieve the estimated capacity of 42.5 million TEUs in 2030, the port container terminals will have to increase their average productivity from 4,700 TEUs per acre per year[2] to over 10,000 TEUs per acre per year[3]. This can be accomplished by a combination of technology (optical character recognition readers at all gates and RFID tags on all trucks), 24-hour operations, reduced free time, grounded operations (stacked containers instead of wheeled operations), modified labor rules (allowing trains to move into terminals while trains on adjacent tracks are being loaded or unloaded), spreading out vessel sailings more evenly over the week, chassis pools, universal appointment systems, and other operating practices. It is not possible to precisely break down the contribution of each strategy to improved terminal productivity. Better planning, coordination, and communication among the shipping lines, terminal operators, trucking companies, and railroads will help. One promising example of better coordination is the proposed BNSF On-Dock Business Exchange, a web-based planning tool that provides a seven-day advanced notice to the railroads of the number of containers to be imported at each terminal and by destination. This would greatly improve the railroad's planning for rail equipment and reduce unnecessary delays to shipments.

Competition for Port Terminal Capacity

Recently, containerized cargo has received the most attention in goods movement planning, but capacity for commodities like petroleum liquid bulk terminals is a growing concern at the SPB ports.

The ports accept crude oil imports for local refineries, and California has become a substantial net importer of refined fuels. California imports 10 percent of its gasoline and diesel fuel and 25 percent of its jet fuel. The concern is that demand is outstripping petroleum storage capacity, and the need to accommodate containerized cargo is crowding out the petroleum facilities.

Limited storage capacity leaves the region vulnerable to a supply squeeze, especially when a refinery goes off-line for repairs or because of a fire. According to the Western States Petroleum Association, "if we can't process imports and exports through our own ports because we don't allow product to move, the end result could be a significant reduction of energy available to California consumers."[4]

The tradeoffs between trade-related priorities and other priorities add to the overall complexity surrounding the expansion of the terminals, and illustrate the fact that decisions about goods movement cannot be made in a vacuum. The demand for terminal space at the ports is not limited to containers vs. petroleum liquid bulk, but to a diversity of land use requirements that the ports must address; e.g., dry bulk, breakbulk, automobiles, commercial fishing activities, institutional/educational, shipyards and light manufacturing, water-oriented commercial and office space, cruise ships, marinas, and other support infrastructure such as utilities and surface transportation, public open space, and visitor-serving recreational uses.

Importers are aggressively seeking to diversify gateways to include other West Coast ports and locations on the Gulf of Mexico and eastern U.S. coasts. Many states along the eastern seaboard are actively recruiting importers and manufacturers alike with enticements of low cost land, no inventory taxes, shovel ready certified sites, job training programs and other infrastructure incentives.

Limited Air Cargo Capacity at Existing Airports

The primary issue for the Los Angeles World Airport (LAWA) authority is finding space to process all of the cargo that moves through its facilities, specifically at LAX and ONT. Delays during peak periods continue to mount at LAX, mainly because of a shortage of ramp space, on-airport warehouse space, and peak-period lift capacity. A lack of warehouse and terminal capacity has often resulted in congestion and delays at existing cargo terminals, specifically the joint use facilities which are operated by a third party, as opposed to individual cargo terminals controlled by a single carrier. In addition, older cargo facilities that do not accommodate modern cargo handling operations often add to congestion and delay.

For these airports (LAX specifically) a core issue stems from land use priorities arising from both passenger and cargo service demand. Airports with highly prescribed demand for both passenger and cargo services often experience competition for space. Though freight cargo facilities at LAX are currently separated from passenger facilities, the potential competition for space does exist.

This type of competition for space affects all aspects of on-airport capacity planning, including runway space, taxiways, apron space (to park aircraft), cargo handling facilities and terminals, and competition for parking and roadways at the airports.

Cargo-Only Airports - Emerging trends point to the development of cargo airports, including the fact that increasing amounts of cargo are transported by cargo freighters. It is now physically possible to substantially separate cargo operations from passenger operations in order to relieve capacity-constrained passenger airports. The announcement by DHL to open an air cargo operation at the GlobalPort at March AFB, as well as the fact that three quarters of the air cargo volume at ONT belongs to UPS, indicates that cargo-only operations in the region have potential. A challenge is the shortage of land to accommodate the extensive warehousing, manufacturing, and intermodal facilities that are associated with state-of-the-art cargo-only airports.

The Reality of Market Forces - The issue of airport expansion, as it relates to air cargo, is also impacted by specific market forces. This is especially true in the context of locating or expanding cargo capacity at other airports in the study area, including cargo-only airports. As stated in Section 2, there are many factors that influence the location of air cargo operations (air freight terminals, runways for larger aircraft, freight forwarders, trucking companies, customs, and Department of Agriculture inspections). However, the core factor is availability and range of flight options and destinations, particularly to other major cities in the U.S. and worldwide, both passenger and freight. Relocation of air cargo capacity to another airport is only feasible for all-cargo carriers if freight forwarders supporting their operations relocate as well. Those freight forwarders who are reliant on passenger belly space may be reluctant to split operations when all options are currently available at a single airport (e.g., LAX). However, long-term trends suggest that as air cargo lift is increasingly accommodated by pure freighters in both the domestic and international market, the need for belly space will decrease in importance, particularly in heavily trafficked U.S.-to-Pacific Rim trade routes.

The successful addition of air cargo capacity in the study area hinges on several factors, one of which is the ability of the airports to work together in partnership.

4.3 HIGHWAY CONGESTION AND DELAY

The SCAG 2004 RTP reported that in the year 2000 total daily delay due to congestion in the study area was estimated at 2.2 million person-hours. Although person hours of delay is a metric used for assessing automobile congestion, it is not a good measure for freight in that it does not account for the hours that goods spend in delay. At most, this measure accounts for the cost of the persons accompanying the goods in the trucks sitting in delay. It is more common to account for the cost of goods in delay by measuring the inventory carrying cost. The impact of delay on the freight industry is significant, since it can increase the hourly cost of carrying goods by 50 to 250 percent, from a base value of $25 to $200 per hour, depending on the commodity.[5]

Table 24 shows a summary of total daily truck volumes by direction along freeways in the study area, as well as the percentage of daily truck volumes traveling during congested periods. The volumes shown represent the sum of all daily volumes from subsections along each freeway; therefore, these volumes represent the cumulative truck volumes along the entire freeway segment identified.

Congested periods are defined as those hours when the observed average speed on any particular freeway segment, as provided by the Freeway Performance Measurement System (PeMS), Version 6.3, drops below 55 mph. The PeMS is an archive transportation data management system. It collects data in real-time, stores and processes this data, and provides a number of web pages that engineers can use to analyze the performance of the freeway system. This project is conducted by the Department of Electrical Engineering and Computer Sciences at the University of California, at Berkeley, with the cooperation of the California Department of Transportation, California Partners for Advanced Transit and Highways, and Berkeley Transportation Systems. Speeds below the 55 mph (general) speed limit for trucks are considered to be an indication of delay, based on the premise that trucks generally try to travel at or above speed limit.

Approximately 18 percent of all trucks, which equates to 240,000 trucks per day, traveling daily on the freeways within the MCGMAP study area are affected by delay. The impacts of delay on trucks are study area-wide. The Ports Transportation Study[6] revealed that 65 percent of container terminal truck trips have origins and destinations within twenty miles of the ports, and area bounded by SR-60 on the north, I-110 on the west, and the I-605 on the east. From the data shown in Table 24, the effect of delay on trucks clearly reaches beyond these boundaries.

Trucks are larger and accelerate more slowly than passenger cars, and thus have greater impacts on traffic flow than passenger cars. In terms of size, trucks may be equivalent to about two passenger cars, but on hilly or mountainous terrain and in congested traffic, their effect on traffic flow is much greater and may be equivalent to 15 or more passenger cars.[7] Larger and heavier trucks affect traffic basically in two ways: because of their size, weight, and operating characteristics, such trucks will increase delay on traffic flow and, in most cases, increase the number and severity of crashes.

While traffic congestion has broad implications across many aspects of the goods movement system (as well as on aspects unrelated to goods movement), the following are illustrations of how it impacts two goods movement sectors (air cargo and warehousing/distribution).

The California Statewide Goods Movement Action Plan[8] identified 12 prospective infrastructure projects within the Los Angeles/Inland Empire Corridor region that could improve the capacity and performance of the goods movement corridor. Many of these projects have received extensive review at the local or regional levels by Metropolitan Planning Organizations (MPOs) or Regional Transportation Planning Authorities (RTPAs) and are included in Regional Transportation Plans (RTPs).[9] These prospective projects were identified at the local level based on known deficiencies in operations, capacity, or performance at the following four (4) specific freeway and roadway locations:

- Alameda Corridor, SR-47, Shuyler Heim Bridge
- I-710 Corridor
- Gerald Desmond Bridge
- I-5, from SR-14 to Calgrove Blvd

Table 24
Total Daily Truck Volumes in Congestion on Study Area Freeways
Year 2004

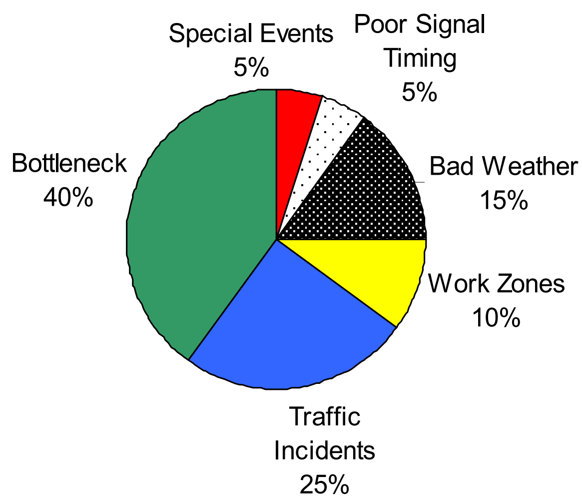
Freeway	Direction	From / To	Total Daily Truck Volume	Daily Truck Volume In Congestion	% Daily Truck Volume In Congestion
I-5	NB	Orange County Line to SR-14	101,575	20,552	20.2%
	SB	Orange County Line to SR-14	100,925	19,295	19.1%
I-10	EB	Terminus to I-15	49,165	5,442	11.1%
	WB	Terminus to I-15	55,566	5,467	9.8%
I-15	NB	Ontario Ave to I-215	34,110	5,921	17.4%
	SB	Ontario Ave to I-215	32,674	449	1.4%
I-105	EB	Terminus to I-405	33,989	7,471	22.0%
	WB	Terminus to I-405	34,524	6,598	19.1%
I-110	NB	SR-47 to Terminus	30,270	6,358	21.0%
	SB	I-405 to Terminus	32,352	5,520	17.1%
I-210	EB	SR-134 to I-15	37,518	2,793	7.4%
	WB	SR-134 to I-15	34,633	3,077	8.9%
I-215	NB	Columbia Ave to I-259	14,159	1,826	12.9%
	SB	Columbia Ave to I-259	13,604	0	0.0%
I-405	NB	I-5 to Terminus	75,979	13,659	18.0%
	SB	I-5 to Terminus	72,329	10,419	14.4%
I-605	NB	LA County Line to I-210	76,814	19,491	25.4%
	SB	LA County Line to I-210	76,814	20,032	26.1%
I-710	NB	I-405 to SR-60	57,799	9,510	16.5%
	SB	I-405 to SR-60	51,256	10,464	20.4%
SR-2	EB	I-5 to Terminus	2,869	0	0.0%
	WB	I-5 to Terminus	2,869	0	0.0%
SR-22	EB	Orange County Line to SR-55	1,490	82	5.5%
	WB	Orange County Line to SR-55	1,682	0	0.0%
SR-55	NB	SR-73 to Terminus	25,300	3,545	14.0%
	SB	SR-73 to Terminus	25,980	5,385	20.7%
SR-57	NB	I-5 / SR-22 to I-210	31,000	5,897	19.0%
	SB	I-5 / SR-22 to I-210	33,091	11,194	33.8%
SR-60	EB	Terminus to Terminus	47,448	7,343	15.5%
	WB	Terminus to Terminus	49,796	10,462	21.0%
SR-91	EB	Terminus to Terminus	71,365	11,480	16.1%
	WB	Terminus to Terminus	75,147	13,509	18.0%
US-101	NB	I-110 to I-405	17,000	3,268	19.2%
	SB	I-110 to I-405	16,429	5,928	36.1%
SR-134	EB	SR-170 to I-210	9,222	431	4.7%
	WB	SR-170 to I-210	9,598	1,016	10.6%
Total All MCGMAP Study Area Freeways			**1,436,342**	**253,888**	**17.7%**

Source: PeMs V. 6.3, Caltrans Traffic Volumes 2004

Highway Bottlenecks

Increased freight flows have had significant impacts on metropolitan areas. Traffic at major freight generators (ports, airports, rail yards, warehouse/distribution nodes) has greatly increased, adding to congestion and impacting surrounding neighborhoods. As shown in Figure 26, about 40 percent of the congestion is estimated to be caused by bottlenecks, recurring congestion at locations where the volume of traffic routinely exceeds the capacity of the roadway, resulting in stop-and-go traffic flow and long backups. The balance, about 60 percent of delay, is estimated to be caused by non-recurring congestion such as construction work zones, crashes, breakdowns, extreme weather conditions, and suboptimal traffic controls.

Figure 26
Typical Sources of Congestion



Source: "Traffic Congestion and Reliability: Linking Solutions to Problems," prepared by Cambridge Systematics, Inc. for the Federal Highway Administration, Office of Operations, Washington, D.C., July 2004

There are four major types of bottlenecks: interchange, steep-grade, signalized-intersection, and lane-drop bottlenecks. Interchange bottlenecks account for the most truck hours of delay, estimated at about 124 million hours annually in 2004.[10] The Transportation Research Board (TRB) and the Federal Highway Administration (FHWA) estimate a delay cost of $32.15 per hour, and most of these costs are passed along to shippers and consumers.

The FHWA estimates that increases in travel time cost shippers and carriers an additional $25 to $200 per hour, depending on the product carried. Table 25 lists the top 6 interchange bottlenecks in the study area, ranked by annual hours of delay for all size of trucks. The impact of the highway truck bottlenecks is measured by total truck hours of delay and the tonnage and value of the commodities in the trucks. Each location on the table was identified using information from the

Highway Performance Monitoring System (HPMS) database and state department of transportation maps. Note that annual hours of delay for all trucks is the number of hours of delay accruing annually to all trucks delayed by congestion at the bottleneck. (e.g., Daily Minutes of Delay per Vehicle multiplied by 2004 AADTT for All Trucks). Because the underlying HPMS data do not detail traffic counts by time of day, the actual number of trucks exposed to peak-period congestion is unknown, and therefore the reported truck hours of delay shown here provide good index to the relative impacts of the bottlenecks, but are not reliable absolute numbers. Annual Average Daily Truck Traffic (AADT), or the number of trucks of all sizes traveling the critically congested roadway each day, was provided from the FHWA Freight Analysis Framework database, based on HPMS data and state department of transportation vehicle counts, extrapolated to 2004.

Table 25
Top 6 Bottleneck Locations in the MCGMAP Study Area Year 2004

Bottleneck			All Vehicles		All Trucks			Daily Minutes of Delay All Trucks
Location	Route No.	No. of Lanes	AADT	Daily Minutes of Delay per Vehicle	AADT	Percent of ALL Vehicles	Annual Hours of Delay All Trucks	
San Bernardino Fwy	10	8	268,700	7.2	34,900	13%	1,552,800	71
SR-134 @ SR 2	134	8	247,900	8.3	29,600	12%	1,489,400	68
Long Beach Fwy	710	8	246,100	8.3	27,500	11%	1,380,300	63
SR-60 @I-605 Interchange	60	8	233,000	8.3	26,100	11%	1,314,200	60
I-405 @ I-605 Interchange	405	10	331,700	9.8	20,900	6%	1,245,500	57
San Gabriel River Freeway	91	10	295,700	8.1	24,100	8%	1,194,300	55

Source: "An Initial Assessment of Freight Bottlenecks on Highways," Federal Highway Administration, October 2005

I-10, with the highest truck hours in delay, carries 488,700 freight tonnages. The annual cost associated with interchange bottlenecks is more than $4 million on I-10. Other freeways in the study area such as SR-134, I-710, SR-60, I-405, and SR-91 carry between 381,100 to 477,500 annual tons of goods. The high cost of congestion means increased supply costs for manufacturers, higher import prices, a higher cost of living for consumers, and a less productive and competitive economy.

Impact of Highway Congestion on Air Cargo Industry

As noted above, 18 percent of all truck volumes on the freeways within the study area travel during congested periods. This has an impact on the goods movement sector as a whole. Highway congestion results in delay for trucks and vans carrying air cargo to and from airports. Air cargo is a time-sensitive business, and air cargo schedules cannot tolerate delay. The implications of delay include the following:

Increase in Shuttle Services - Cargo carriers substitute ground delivery vehicles with small commuter planes to shuttle cargo into airport handling centers from outlying areas (typically served by truck), bypassing ground congestion. This increases the cost of air cargo service and also increases congestion at air cargo facilities on the airport, including runways and taxiways.

Delay in Line-Haul Departures - Delay of on-ground deliveries to airport cargo handling facilities may delay the line-haul flight departures that connect to the central airport hubs, risking on-time arrival for the sorting that occurs at the central hub. Air cargo service providers have a very small window during which they are able to handle the sorting and matching of loads at the central hubs before flights have to depart for early morning arrival. The implication to the air cargo provider is a reduction in service quality (on-time delivery). Customers expect packages to arrive on time.

Impact on Warehousing, Distribution, and Logistics Industry

Increased traffic congestion presents a broad range of impacts to the warehousing and distribution business, including increased costs, reliability of service, and erosion in market reach. As pointed out earlier in this Tech Memo, warehouse and distribution centers are generally defined by the type of market area they serve, specifically local (within 75 miles), Pacific Southwest (250 miles), and regional (450 miles). Increased delay due to traffic congestion limits the effective market reach. The implication is that service providers find it more difficult to provide reliable service to the outer reaches of the specific market service areas, forcing them to either abandon services to customers that are on the fringe, to reposition assets, or add new assets (build satellite terminals). The resulting implications are additional cost and eroded service levels. Increased traffic congestion also has similar implications for the growing transload business sector.

Highway Maintenance

Another issue affecting the goods movement system is highway maintenance and operation. The larger and older the system becomes, the more expensive it is to maintain and operate.

Road damage caused by heavy trucks is a key issue. According to the American Association of State Highway and Transportation Officials (AASHTO), the maintenance cost impact related to axle weight increases at a gradual rate up to 10,000 pounds and rapidly increases above 16,000 pounds. It also concluded that pavement damage increases exponentially as axle weight increases, and that the passage of an 80,000 pound, five-axle tractor-trailer has about the same impact on highway deterioration as that of 9,600 automobiles.

The average urban motorist in the U.S. pays $400 annually in additional vehicle operating costs as a result of driving on roads in need of repair. Poor road maintenance contributes to accelerated vehicle deterioration, increased frequency of needed maintenance, and increased fuel consumption.[11] However, trucks and cars each pay about 80 percent to 90 percent of their total road costs.[12]

In addition, the study area has a disproportionately higher share of trucks carrying goods to and from outside of the study area, further adding to the controversy.

4.4 TRUCK ACCESS AND TURNAROUND AT FACILITIES

The performance measures outlined in Section 3 of this Tech Memo summarized truck turn times and wait times at ports, intermodal yards, and warehouses. Trucks at the ports spend a significant time queuing and waiting for their appointments, accounting for up to half of the total round trip time. While delay also occurs on the highway system, the most significant part of delay is currently associated with wait times at the ports. The cost of this delay is transferred to industry (carriers and shippers/receivers) and ultimately to the consumer.

4.5 MAINLINE RAIL CAPACITY

Primarily as a result of growth in the intermodal container market, mostly due to growth in Asian imports, mainlines east of Los Angeles are reaching their capacity. The average train trip is delayed by over 30 minutes between Los Angeles and Colton.[13] The two main railroads operating in the study area frequently point to several capacity issues:

- Both the UP and the BNSF report capacity constraints in the Cajon Pass. BNSF is constructing a third main track between San Bernardino and the pass summit at a cost of more than $100 million. This project will be completed in 2008.
- The BNSF has stated that its Transcon line will be at capacity between Commerce and Fullerton by 2010 if a third track is not constructed.
- BNSF views the next project requiring funding to be the Colton Crossing grade separation of the Transcon and the UP El Paso Line.
- BNSF believes that its next priority is a third track between Riverside and Porphyry (Corona).
- BNSF estimates that the number of trains operating between West Riverside and Colton (a Transcon segment shared with the UP) will increase by 37 percent by 2010. This is based on assumptions about port-related intermodal growth.
- UP intends to install double track on the entire Sunset Corridor from Colton Crossing to El Paso in the next few years to resolve capacity constraints on this line.[14]

Inadequate mainline capacity results in reduced system velocity, which in turn results in increased backlog at intermodal yards and classification yards. Service disruptions can have a dramatic effect on system performance. For example, Hurricane Katrina reduced velocity on the UP system, resulting in increased dwell times for the intermodal containers at the ICTF from a typical 24 hours to a high of 4 days. These backups cause delay in the delivery of time-sensitive shipments as well as a domino effect reaching other staging areas such as the ports.

Capacity constraints on the mainlines are the result of growth in passenger rail traffic as well as freight rail traffic. For example, the UP is considering plans to reroute Metrolink's Riverside-Los

Angeles commuter train service to the Alhambra Line west of Pomona.[15] This operational change would reroute commuter trains off the Los Angeles Subdivision between Pomona and downtown Los Angeles. The UP also plans to build additional capacity on the Alhambra Line east of Pomona to facilitate a crossover of UP freight trains from the Los Angeles Subdivision to the Alhambra Line.

These plans could eliminate numerous UP freight train movements operating between West Riverside and Colton on the Transcon. In addition, the commuter train route would be largely free of freight trains, making the schedule of both passenger trains and freights trains more predictable. However, these capital projects are not currently budgeted by public agencies or UP. In addition, the existing Southern California Regional Rail Authority (SCRRA) agreements will require renegotiation for the reroute of commuter trains as described above.

BNSF and UP have stated that Metrolink service improvements increasingly consume their freight rail line capacity. Accordingly, both BNSF and UP are seeking public money to fund most of the projects that are inside the Metrolink commuter train operating limits.

4.6 INTERMODAL RAIL CAPACITY CONSTRAINTS

Given the increase in intermodal freight transportation in the study area, most intermodal facilities are experiencing capacity constraints. In addition, there is significant support for moving intermodal capacity closer to and onto the ports, thereby reducing the amount of local truck traffic. However, there are potential obstacles to realizing the full benefits. Examples of these constraints, specifically on-dock, near-dock, and off-dock intermodal facilities, are discussed below.

Since deregulation the railroads have been merging and consolidating routes. Many lines segments which did not have sufficient rail traffic density to justify maintenance and repair work were sold to short line operators. With increasing energy costs and difficult structural changes facing the trucking industry (increased fuel, insurance, equipment and driver recruiting expenses) rail has enjoyed resurgence. This recent growth has by and large absorbed any excess capacity the carriers may have had previously. Today rail rates are increasing in response to demand for more rail capacity. Several trends associated with this rail renaissance are important to note.

Velocity is a key to increasing throughput. This focus on velocity improvement is across all train types and facilities. It is important to increase both terminal velocity as well as linehaul velocity.

This increased demand has also resulted in a reassessment of business segments and current markets. Carriers are focusing on freight which will fill their networks with long-haul end to end density. International traffic is ideal for most carriers, moving from ports to inland markets. Short haul or intermediate markets are being “harvested” from network service as demand and growth in the end-to-end market pairs increases. This means that markets between Southern California and long-haul eastern gateway cities such as Chicago, St. Louis, Kansas City, Memphis and New Orleans are preferred markets. Intermodal terminals intermediate to these locations may not be sustainable if traffic volumes, balance and density do not support trainload volumes.

Railroad business segments (intermodal, coal, carload, automotive, etc.) have different levels of service and profitability. Intermodal and unit train businesses such as coal and grain, where users bring their own equipment to the carrier, are more desirable than single car boxcar services. Many single car shippers are facing steep rate increases if they can't increase the number of shipments or reduce the switching costs to serve them. In some cases this is pushing shippers to rethink rail service all together. In some rural and secondary markets intermodal terminals are being closed and carload service is being reconfigured. Some users in these markets are actively converting portions of traditional carload business to intermodal and some is moving to over-the-road services. The recent trend with Class 1 rail carriers favors intermodal and unit train traffic over carload and mixed user trains.

Throughput is a function of operational practices as well as the type of business at that facility. For example, the City of Industry facility on the UP and the San Bernardino facility on the BNSF focus on domestic intermodal shipments, whereas the East Los Angeles facility (UP) and the Hobart facility (BNSF) handle a mix of domestic and international intermodal traffic.

Based on acreage and volume data for the various intermodal terminals in the study area, the annual per acre throughput estimates are as follows:

- BNSF's San Bernardino facility - 285 acres with a maximum potential throughput of 750,000 lifts per year - 2,600 lifts per acre
- UP's Los Angeles Transportation Center (LATC) - 130[16] acres with 250,000 lifts annually - 2,100 lifts per acre
- UP's East Los Angeles (ELA) - 150[17] acres with 450,000 lifts annually (high) - 3,200 lifts per year (capacity is 550,000 lifts per year - 3,900 lifts per acre)
- UP's Intermodal Container Transfer Facility (ICTF) - 237 acres with 650,000 lifts in 2005 - 2,700 lifts per acre (capacity is 850,000 lifts annually – 3,500 lifts per acre)
- BNSF's Hobart Yard - 245 acres with 1,350,000 lifts in 2005 – 5,500 lifts per acre

The reason for the greater throughput results for Hobart Yard is that the BNSF employs a more expensive but more productive work process there. This includes the vertical stacking of containers by destination and chassis storage on racks. The UP at ICTF has the luxury of a "wheeled operation," where every container is on a chassis. The latter is a lower-cost option, but limiting in container throughput relative to acreage under management. BNSF has allocated containers (per ocean carrier), imposed large detention charges (if over one day), and imposed other restrictions on access to Hobart to increase throughput.

In addition to the varying practices that impact throughput and capacity, there are specific issues related to on-dock facilities that warrant further discussion.

On-Dock Rail Facilities

The benefit of on-dock rail is the reduction of truck traffic on the local roadway system. However, while on-dock facilities are seen as an important solution to congestion in the region, they present significant challenges from a capacity standpoint. Terminals are being configured to optimize container and rail yard space. On-dock rail yards cannot simply be built to accommodate all direct intermodal cargo for two primary reasons: 1) terminal area constraints that impact container yard area and track layout, and 2) there will always be the need to dray containers to off-dock rail yards due to railroad and shipper logistics (for example, when there is not enough destination-specific volume from one terminal to warrant building an entire unit train on-dock). Also, it is important to note that major expansion projects are needed to construct new or to improve existing on-dock rail yards. Thus, there are some existing constraints to maximizing on-dock rail movements.

Another significant operation constraint for on-dock facility throughput is a restriction on train movements in and out of the facilities while trains on adjacent tracks are being loaded and unloaded. This restriction was implemented to address safety concerns for marine terminal workers who load and unload the trains at on-dock facilities. In comparison, railroad-owned and -operated near-dock and off-dock facilities do not have this constraint, and as a result see higher productivity. Railroads feel their safety procedures allow them to both load and unload trains and arrive and depart trains at the same time in the same facility.

Another constraint is available dock space. Finished vehicles take up large quantities of dock space. Ports are facing increasing demand for high throughput container traffic. Both domestic and import auto companies are faced with increasing costs if they stay at their current facilities, some are looking at new locations when their current leases expire. Some of these locations are in nearby facilities such as San Diego and Hueneme; other locations in other gateway cities are expanding.

As a result, while on-dock rail presents significant environmental and congestion relief benefits, this type of operation presents significant operational constraints that impact railroad productivity.

4.7 GRADE-CROSSINGS

The increase in rail freight traffic in the study area has significant implications relating to safety, environmental issues, community impact, financial concerns, and traffic congestion. Issues include:

- Highway traffic delays and congestion
- Rail, vehicular, and pedestrian traffic conflicts
- Economic and environmental implications
- Railroad operations and derailments
- Rail-highway crossing conflicts

One of the more notable goods movement projects in the study area was developed specifically to address many of these issues. The Alameda Corridor consolidates harbor-related rail traffic from four separate branch lines into a 20-mile, fully grade-separated route. The corridor connects the POLA and POLB to the transcontinental rail line near downtown Los Angeles, eliminating traffic conflicts at 200 at-grade crossings, reducing accidents and improving the safety of the traveling public, and reducing emissions and congestion.

Based on the results of the Alameda Corridor, the Alameda Corridor-East Construction Authority, the OnTrac Joint Powers Authority, Riverside County, and San Bernardino County have identified grade crossings that need to be improved or grade-separated. The federal Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) earmarks $167.64 million to the Alameda Corridor-East, which would be split among Los Angeles, Orange, Riverside, and San Bernardino counties. An additional $42.88 million has been earmarked for individual grade separations east of downtown Los Angeles.

These projects are under-funded; the earmarks will not deliver the expected funding levels, leaving local communities and agencies struggling to meet the capital investment needs. With the expectation that rail freight traffic will increase, communities along the main lines will continue to face environmental, safety, and congestion impacts as long as the necessary funding levels are not met. Over the long-term, the implication is the continued deterioration of the public's perception of goods movement and its willingness to support further growth.

Simulation studies show the significant impact of vehicle delay at highway-railroad grade crossings along the mainline infrastructure from downtown Los Angeles east and north to Barstow and Indio. The simulated value of total vehicle hours of delay in year 2000 was calculated to be 2,622 hours per peak day.[18] Extrapolating this to an annual value, assuming 300 peak days per year, potentially yields nearly 790,000 vehicle hours delay at these crossings. As the railroads within the MCGMAP region move towards longer trains (8,000 ft.), the extent of grade crossing delays could increase.

Environmental issues at crossings relate to the emissions caused by vehicle delays. A 2005 study by Leachman and Associates established baseline emission conditions from simulation models, including traffic delay emissions at grade crossings.[19] These results are shown in Table 26 below.

Table 26
Mainline Rail Emissions (tons per year) for Year 2000

Contributor	ROG	CO	NOx	PM10	SOx
Rail Emissions	498.43	721.29	15424.10	347.56	958.36
Traffic Delay Emissions	9.65	100.46	13.85	0.54	0.09
Cumulative Emissions	508.08	821.74	15437.95	348.10	958.45

Rail derailments occasionally occur, and they vary in size and impact. When a derailment occurs, the FRA and the railroads investigate it and take corrective action. Projects such as the Alameda Corridor can reduce the impacts of derailments on local communities by separating the rail from adjacent residences.

4.8 HIGHWAY SAFETY AND TRUCK ACCIDENTS

Trucks have a significant impact on the safety of the traveling public. Accidents involving trucks have a higher degree of severity due to the relative size differential between trucks and cars. Of all crashes involving large trucks and passenger vehicles, 84 percent of the fatalities are passengers in vehicles other than the large truck. [20] The great differential in size and mass generally places the occupants of the passenger vehicle at a great disadvantage in such collisions.[21]

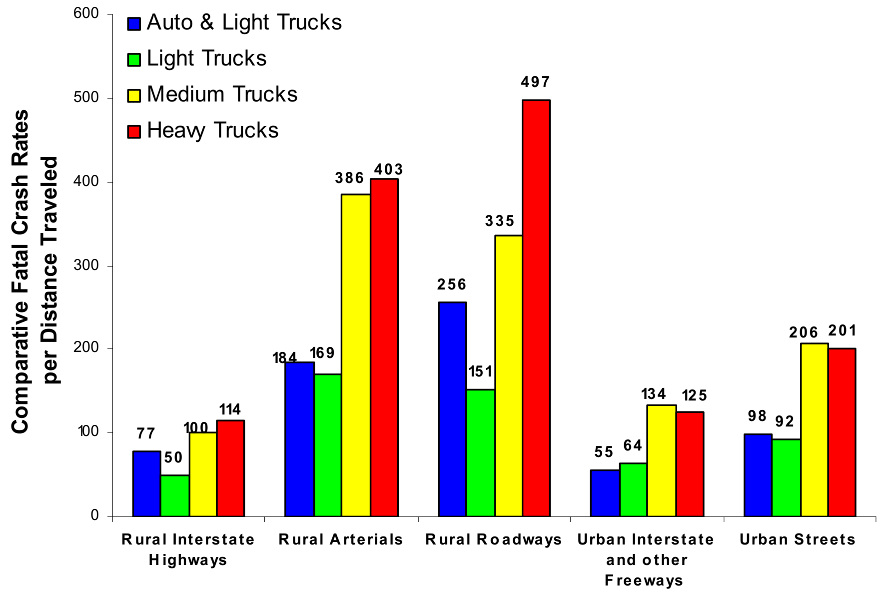
The difference in the size of the vehicles also increases the perception of being more vulnerable. "Large trucks can intimidate motorists traveling in passenger vehicles. It is not unusual for relatively small passenger vehicles to be boxed in by trucks in front, behind, and alongside them. If all vehicles in the general-traffic lanes were roughly the same size, there would be less stress on those motorists who are nervous about sharing the road with large trucks."[22]

Safety on roadways, as it relates to truck traffic, is a factor of the truck volumes and total congestion on the roadway system. The propensity for truck-involved accidents is found to be a decreasing function of the number of lanes and the average annual daily traffic (AADT) per lane, and an increasing function of truck percentages of AADT, all factored by the effects of time of day, day of week, and weather conditions.[23]

From 2000 to 2003, fatalities increased by 17 percent, while injuries remained relatively flat for the study area as a whole. Moreover, the data for truck accidents in the study area correlates with overall truck travel volumes in the study area, by county. In 2003, the highest number of fatalities and injuries involving truck accidents occurred in Los Angeles, Riverside, and San Bernardino counties, which account for the majority of truck travel volumes in the study area.

Fatal crash rates for single-unit trucks and heavy trucks are separated by roadway functional class, as shown in Figure 27. Several patterns are evident. First, the involvement rate on rural Interstate highways is 300 percent to 400 percent lower than it is on rural roadway types and is generally the same for all vehicle types.[24] Of particular note is that off Interstate highways, the involvement rates for medium and heavy trucks are markedly higher than for cars and single unit trucks. When compared on the same rural roadway types (where these vehicles accumulate the majority of their travel and, therefore, exposure to crash risk), medium and heavy trucks consistently exhibit higher rates than single-trailer combinations.

Figure 27
Fatal Crash Rates on Different Highway Classes



Source: Comprehensive Truck Size and Weight (CTS&W) Study, Volume 3 U.S. Department of Transportation, August 2000

Table 27 displays a summary of truck accidents within the counties of the MCGMAP study area.

Table 27
Truck Accident Summary by County
Year 2000 and Year 2003

	2000		2003	
County	Fatalities	Injuries	Fatalities	Injuries
Los Angeles	66	3,526	73	3,411
Orange	9	825	14	629
Riverside	28	674	37	833
San Bernardino	38	1,008	37	1,165
Ventura	4	201	9	207
TOTAL	145	6,234	170	6,245

Source: California Highway Patrol 2004

Table 28 presents critical accident locations in Los Angeles County for 2003. This table indicates how the severity of the accident rate on I-710 compares to other freeways in the Los Angeles County. Accidents on I-710 are largely due to design deficiencies, high traffic volumes, and the current vehicle mix of autos and heavy-duty trucks.[25] These accidents cause property damage, injuries, and fatalities as well as vehicle delays. SR-91, SR-60, and I-605 are also considering critical accident locations in the MCGMAP area.

Table 28
Truck Involved Accidents by Freeway in Los Angeles County
Year 2004

Freeway	Truck Involved Accident	% of Total	Length (mi)	Truck Accidents /mi
I-5	885	20.91%	162.9	5.43
I-10	450	10.63%	111.6	4.03
I-710	432	10.21%	46	9.38
I-405	385	9.10%	97.4	3.95
SR-60	369	8.72%	61.3	6.02
I-605	316	7.47%	54	5.85
U.S.101	291	6.88%	113.1	2.57
I-210	242	5.72%	95.3	2.54
I-110	193	4.56%	45.6	4.23
SR-91	175	4.14%	29.4	5.95
SR-57	74	1.75%	17.8	4.15
I-105	67	1.58%	35.6	1.88
SR-14	53	1.25%	107.4	0.49
SR-1	52	1.23%	46.7	1.11
SR-134	50	1.18%	26.8	1.86
SR-138	36	0.85%	35.1	1.03
SR-118	35	0.83%	30.1	1.16
SR-2	17	0.40%	18.6	0.91
SR-71	16	0.38%	3.6	4.5
SR-72	13	0.31%	13.3	0.97
SR-19	11	0.26%	25	0.44

Source: Truck Count Study, SCAG, December 2004

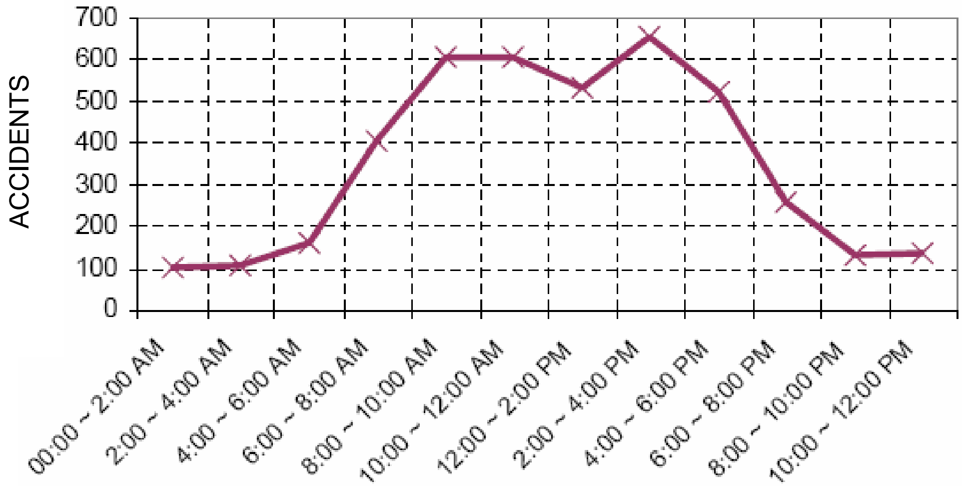
A summary of critical accident locations on the state highway system throughout the MCGMAP region is provided below:

- **I-5** Corridor from north of Rye Canyon Road to Honor Rancho Drive north of SR-126 experiences a high rate of accidents.
- **I-710** experiences about five accidents each day between Ocean Boulevard and SR-60[26]. The two worst locations are at the I-405 interchange and just south of the I-5 interchange.
- **SR-60** in Los Angeles County experiences high truck accidents between I-710 and Route 57.
- **SR-91** corridor has three major accident Locations: SR-55/SR-241, SR-241/SR-71 and SR-71/SR-15
- The greatest overall number of collisions within the **I-15** study area occurs through the Cajon Pass between SR-138 and US-395.

Figure 28 displays the distribution of truck-involved accidents by hour during weekdays. There are two observations to be made from the graph. First is that accidents involving trucks generally follow the time-of-day distribution for truck travel in general (as shown in the Roadways portion of Section

2.0 of this report). Second is that the number of accidents spikes during the peak morning and evening commuter travel periods. This indicates that accidents involving trucks increase when truck travel increases as well as when commuter traffic increases.

Figure 28
2003 Truck-Involved Accidents by Hour on a Weekday
(Number of Accidents Involving Trucks – Left Axis)

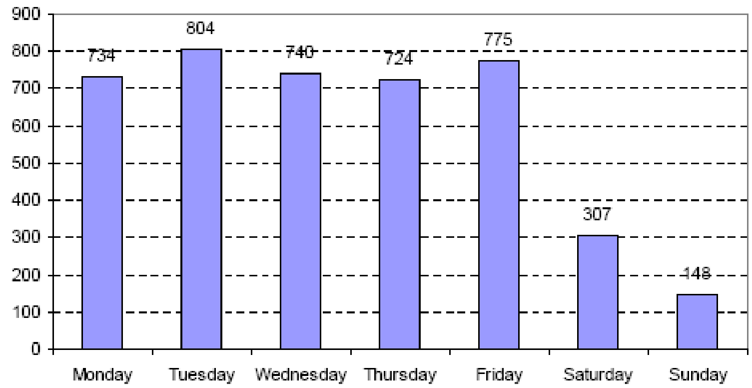


Source: 2003 Statewide Integrated Traffic Records System data, California Highway Patrol's Information Management Division

A 2005 study by Golob and Regan reveals that accidents involving trucks are an increasing function of truck percentages of total AADT.[27] This finding does not correlate with data for the study area. Accidents involving trucks actually decline when truck percentages increase (during the midday hours). This indicates that a stronger contributing factor is the increase in commuter traffic (commuter traffic peaks around the same time as the number of accidents involving trucks spike, and while truck traffic volumes are not at their peak).

As shown in Figure 29, truck-involved accidents occur with similar frequency on the weekdays, with a marked decline on weekends. Again, this is indicative of the propensity for increased truck-involved accidents during days when both truck traffic and non-truck traffic are high.

Figure 29
Truck-Involved Accidents by Day of Week
(Number of Accidents Involving Trucks – Left Axis)



Source: 2003 Statewide Integrated Traffic Records System data, California Highway Patrol's Information Management Division

Cars and trucks in mixed-flow lanes represent a serious safety issue. Again, when an accident involving a truck results in fatalities, there is a high likelihood that an occupant of the passenger car is the victim. However, the statistics indicate that truck-involved accidents are more likely to involve property damage only (PDO), as opposed to injuries or fatalities (injury accidents).[28] As an illustration of this point, Table 29 presents the accident statistics for truck involved accidents in Los Angeles County. While 80 percent of all accidents involving a truck result in property damage, less than 1 percent result in a fatality or an injury.

Table 29
Truck-Involved Accidents by Collision Severity in Los Angeles County
Year 2003

Collision Severity	Number of Accidents	% of Total
Property Damage Only (PDO)	3,373	79.70%
Fatal	32	0.76%
Severe Injury	32	0.76%
Other Visible Injury	288	6.81%
Complaint or Pain	507	11.98%
TOTAL	4,232	100.00%

Source: 2003 Statewide Integrated Traffic Records System data, California Highway Patrol's Information Management Division.

In addition to the data regarding accident rates and severity, truck-involved accidents often result in traffic congestion due to the blockage of travel lanes. Therefore, in addition to safety as a major issue affecting the movement of goods along the roadways in the study area, accidents can cause reductions in available capacity and increase congestion.

Highway Design Deficiencies

Many old existing highways such as I-710 have non-standard features which cause congestion and safety concerns. A summary of the types of deficiencies is provided below:[29]

- **Non-Standard Weaving Distances:** The necessary weaving distance is based on the number of vehicles weaving, and trucks require substantially more weaving distance than do automobiles.
- **Narrow/Non-Existent Shoulders:** Throughout much of the study area the shoulders provide narrow (non-standard) width and in some segments no shoulders are provided at all.
- **Narrow Lane Widths:** Narrow lanes tend to reduce the motorists' comfort level and speed, thus reducing overall capacity, especially when trucks are present.
- **Non-Uniform Ramp Metering:** Some of the ramps within the study area have limited storage distances, and if additional meters are installed, they would have to include ramp widening to provide storage capacity.
- **Median Barriers:** Most of the median barriers on old freeways are an older metal beam type that is no longer in standard use.

4.9 SECURITY

Another issue facing the goods movement system in the study area is seaport, airport, and railroad security. There is the potential that security requirements for air cargo and port cargo will change in the future. Uncertainties in anticipated legislation and their resulting regulations make it difficult for airports and cargo carriers to plan for structural and operational changes with any degree of confidence.

The primary air cargo security measures currently in place include the following:

- **Known Shipper Rule**, which in effect limits passenger airlines (or freight forwarders) from accepting cargo from shippers who have not been through a formal verification process.
- **16-Ounce Rule**, which states mail moving via passenger carriers is now limited to pieces weighing less than 16 ounces. This restriction effectively eliminates all U.S. mail parcel traffic moving on commercial passenger carriers and forces this traffic either onto trucks or all-cargo carriers.
- **Airside Access Requirements** (for both commercial passenger and all-cargo carries) state that all airside access points for cargo must be secured by appropriate means (gate and/or security guard) to insure authorized access only.
- **Airside Access Security Clearance** requirements state that all employees requiring airside access must undergo a security screening.

Two bills on railroad security and safety are under consideration in the California State Assembly. AB 3023 would, among other things, require every rail operator by January 1, 2008, to develop and implement an infrastructure protection program to protect rail infrastructure in the state from acts of sabotage, terrorism, and other crimes. AB 158 would create the Special Railroad Safety Task Force to meet monthly through 2007, study certain railroad safety issues, and make recommendations for improvements in railroad safety measures.

Air Cargo Screening

A key issue facing airports is the proposal to require 100-percent cargo screening. There are currently two amendments to the 2006 Department of Homeland Security authorization bill dealing with air cargo screening. The first would require 100 percent screening of all cargo traveling on commercial passenger carriers by 2008, and the second would require airlines to inform passengers if unscreened cargo is aboard the aircraft. The implication for airports and air carriers (both passenger and all-cargo) is that these rules will result in the greatest operational, financial, and capital-intensive challenge of any air cargo security program to date.

To be effective, all physical infrastructure required to accommodate an air cargo screening program must be located on, or directly adjacent to, secure airport facilities. This will require airports to provide the following:

- Large amounts of land near air cargo facilities
- Consolidation of air cargo facilities
- Additional warehouse/screening buildings
- Separate and secure access roads for queued trucks
- Additional security personnel
- Screening equipment/technology

When the Transportation Security Administration (TSA) decides on the technology and methodology to be used for screening air cargo, individual airports will need to react and adapt to meet regulations. Several proposed and anticipated methods of balancing tighter security with efficient movement of cargo include the following:

- Create truck access points that are separate from other traffic
- Have a centralized truck screening facility
- Limit the number of access points to the airfield
- Place air cargo facilities and aircraft in a concentrated location
- Limit the on-airport distance cargo must travel

Note that the outlined security initiatives, all focusing on cargo screening, involve direct on-airport facility redesign, land use, and infrastructure development. While the technology to be used for such screening is still under development (short of manual unpacking, inspecting, and repacking of all shipments), the burden of accommodating the location, support, and housing of screening technology is a pending airport issue.

The worst-case scenario for airport operators (and carriers) is a 100 percent air cargo-screening requirement. A more likely scenario is a cargo-screening requirement for air cargo moving via passenger carriers, while all-cargo carrier and integrators will rely on "scientific risk assessment" and a regime of random package/shipment screening. However, it cannot be assumed that this will be the case, and, as a result, airport operators must prepare for the potential requirement of 100 percent cargo screening.

Maritime Security Issues

The California Marine and Intermodal Transportation System Advisory Council (CALMITSAC) recently submitted an interim report to the California State Legislature that included a section on maritime security.[30] According to that report, maritime security and ports rely on a "layered" approach, many of whose participants are not at the ports specifically. Effective maritime security requires "multiple lines of defense" across the entire trip length of a shipment, from origin to destination. So the first real issue is the need for cooperation among all of the agencies and entities involved in maritime security. Because there are many different agencies involved in homeland security, the second key challenge is avoiding "overlap, duplication of effort, and conflicting regulations." Another key challenge is the ability to effectively share in "intelligence information among federal, state, and local agencies."

Since September 11, 2001, ports and terminals have increased "surveillance, fencing, lighting, training, and patrols." The core issue for the ports is that the bulk of this increase in security activity is largely funded by the ports themselves. For the most part, "federal port security funding has been inadequate." California as a whole, and indeed the study area, gets a proportionately low share of federal funding for security at the ports. "While California accounts for 40 percent of the containerized waterborne commerce in the U.S, in the [FY 2005 round] of federal port security funding, California received $33,599,417, or 24 percent of the national total of $141,969,968."[31]

In response to September 11, 2001, Congress passed the Maritime Transportation Security Act of 2002. As a result, the largest port security program since World War II was launched. The federal agencies with the largest presence at the ports since then are the Coast Guard and Bureau of Customs and Border Protection (CBP). Some of the notable changes and improvements in their respective programs include the Coast Guard's requirement that ships comply with the Notice of Arrival (NOA) requirement within 96-hours of arrival, up from 24 hours prior to 9/11. The NOA allows the Coast Guard extra time to identify high risk ships for boarding when they arrive at the port. The CBP, which uses cargo information to pre-screen inbound containers, has advanced the timing of the required data on inbound cargo from carriers. In fact, through the Container Security Initiative (CSI) program, CBP inspectors actually inspect cargo at foreign ports of loading before departing for U.S. ports. The CBP has also increased its focus on the supply chain, in addition to focusing on individual shipments. The Customs Trade Partnership Against Terrorism (C-TPAT) gives importers that comply with supply chain security measures preferential treatment for expedited processing of their cargo.

While there is a general consensus that these programs work, there is some concern whether they are adequate in addressing security threats. The Government Accountability Office (GAO) found several shortcomings with the CSI and C-TPAT.[32] For example, the GAO found that C-TPAT participants were benefiting from reduced scrutiny before CBP had actually confirmed that the recipients were complying with the supply chain security measures. It also found that some of the containers that the CBP targets for inspection at the foreign port of departure are not being inspected.

The issue for Congress is how to increase port security to higher levels without compromising the economic security of trade.[33] There are several major areas of concern: the integrity of overseas screening and loading programs to ensure that the container was not loaded with illegal cargo at the overseas factory, that the loaded container was not tampered with while trucked to the port of loading, and that the cargo information reported to CBP is not fraudulent;[34] and the identity of ocean vessels and their occupants (crews).

Regardless of what Congress decides, increased security measures are likely. It is uncertain whether the bulk of these potential measures will occur at U.S. ports or overseas. The fact still remains that port security as it exists today is under-funded and the study area's ports receive a disproportionately lower share of funding for security.

4.10 AVAILABILITY OF FUNDING

A major constraint to the future development of the goods movement system is the shortage of funding for worthy projects. SAFETEA-LU (P. L. 109-59) provided $286.4 billion in guaranteed spending for highways, rail and transit programs over six years (FY 2004 to FY 2009). This represents a 38% increase over funding levels in the Transportation Equity Act for the 21st Century (TEA-21). Excluding FY 2004, the guaranteed funding level in SAFETEA-LU is $244.1 billion.

SAFETEA-LU, while providing support for several key projects, granted far less funding for goods movement than requested. Examples of significant freight projects that saw a funding shortfall are the Gerald Desmond Bridge and the grade crossing projects related to the Alameda Corridor East and OnTrac. The bridge project and the grade crossing projects each received only 19 percent of what was requested.

In order to generate the levels of revenue needed to fund significant goods movement efforts and requisite mitigation strategies, it will not suffice to rely solely on federal and state sources. Opportunities for local and private funding sources will need to be evaluated further. Subsequent tasks of this project are likely to corroborate this assumption.

4.11 CHANGES IN REGIONAL SHIPPING AND TRANSFER MODES

Several changes have occurred in the way goods are transferred from the ports to inland locations. Again, while this issue may gain further mention and significance during subsequent efforts in this project, it is a currently emerging trend. Trends in shipping patterns, modal reliance, and mode-to-mode transfer need to be identified and recognized.

One example frequently discussed is the development of a shuttle rail service to an inland staging area (or inland port). While implementation of a shuttle train from the ports to an inland location would potentially reduce traffic congestion, it could also increase the delivery time from ships to warehouses (the shuttles may also require public subsidies to be cost-effective). Rail carriers are reluctant to support a short-haul rail service when the demand for long-haul business is so strong. The railroads are concerned about "wasting a train start" on short-haul business unless equal volumes can be generated to move eastbound over the remaining portion of their network. The study area has a large number of warehouses and 3PL firms distributed along the corridor that extends from the ports to downtown Los Angeles, and then east along SR-60 into the Inland Empire.

Alternative technologies are also being explored to handle short-haul traffic and truck transfers between port terminals and trains. Several of these new technologies will be discussed in subsequent tasks of the MCGMAP.

The growth of the transload business also requires mention here. Given that the role of this sector is to consolidate international containers into larger domestic containers, a large portion of which are transferred to intermodal services, they will continue to favor locations close to the intermodal yards. The implication for MCGMAP is that the strength of this transload market will continue to influence the location of goods movement consolidation activities near and around intermodal facilities, despite the trend for the newer (and larger) warehouse and distribution activities to move to more distant locations.

These trends present opportunities and challenges that must be identified and included among the tools and options for accommodating growth in goods movement traffic and potentially mitigating the impacts of goods movement.

4.12 MIGRATION OF LAND USES AND DEVELOPMENT

The preferred location for the construction of new manufacturing and warehousing facilities has "migrated" from urban areas to suburban or rural locations, often in search of cheaper land and labor. The result is a land use impact on the surrounding residential uses at these new locations. Further implications are the longer hauls required by truck carriers to reach more distant facilities. At the same time, these facilities are not being built with rail sidings.

As this trend gains strength, existing warehouse and distribution centers located near the ports and downtown Los Angeles will leave current areas, with a subsequent loss of local jobs, unless the traffic and congestion and other constraints related to these areas are addressed. Those that do relocate will most likely move to locations outside of the Los Angeles basin, including the High Desert and Southern Kern County, and even out of state to cities such as Reno, Nevada and Phoenix, Arizona. Even if the warehouses and distribution centers move further inland, the containers from the ports still have to traverse the freeways and rail lines through the Gateway Cities and other sub-regions to get to these inland locations. Thus, the MCGMAP must address the needs of the highway and railroad systems and be responsive to changes in logistics.

A further implication is that the very same concerns raised by communities with regard to existing goods movement-intensive land uses will continue to be raised as the freight-intensive activities emerge elsewhere, and will likely gain in intensity. Again, if these conflicts are not addressed, counties will increasingly become resistant to goods movement as a whole.

4.13 SYSTEM-WIDE GOODS MOVEMENT DATA AND INFORMATION

One of the key challenges facing the study area's goods movement system is the availability of system-wide goods movement data and information. A significant level of data and understanding on goods movement is available today, some of which are presented in this Tech Memo, and some of which will be used in subsequent efforts; there are, however, two areas of particular concern that need to be mentioned here (although these are not the only areas of concern).

The first is in the **use of traditional travel demand modeling**. The agencies involved in this MCGMAP study are currently engaged in an effort to improve existing travel demand models and data, specifically the truck model developed and operated by SCAG. Specific efforts are focused on improving the understanding of local goods movement flows and patterns, as well as improving the estimation of truck trips generated from goods movement land uses such as ports and intermodal yards. The study area agencies are also working on improving rail capacity data and modeling, specifically as it relates to the operation of commuter trains on a predominantly freight system.

The second area of concern is the **lack of system-wide goods movement performance measures**. The previous section (Section 3.0) of this Tech Memo discusses this issue in detail. While there is some degree of performance monitoring and management by various parties within the overall goods movement system, there are no ongoing efforts, tools, or entities focused on measuring the system-wide performance of goods movement in the study area. As a result, there are instances where policies and approaches deployed on one part of the system lead to negative impacts elsewhere. The lack of system-wide performance measures and data potentially undermines the ability of joint efforts such as the MCGMAP to effectively deploy system-wide solutions. Without good system-wide performance data, it is difficult to measure and manage the implementation of specific strategies, investments, and policies.

A case in point are policies focused on lengthening operating hours (at ports, warehouses, and other freight land uses) so as to shift as much truck traffic as possible to off-peak hours, thereby reducing conflict with commuter traffic. In order for such policies to be optimal, system-wide understanding and management of the impacts of such policies throughout the system are needed. A system-wide approach should reveal the effect of these policies on operating costs for shippers, carriers, terminal operators, and warehouse operators at the same time that it understands and measures the impact of conflicts with nearby residential developments in heavily populated areas (additional noise and traffic at night). It should also understand and monitor the real effect on capacity; i.e., where the reductions in congestion and delay are, who benefits, and to what degree.

Another example is the PierPASS program which, in itself, is a success. It has made significant changes to the distribution of truck trips away from peak periods, shifting between 30 percent and 35 percent of container cargo to off-peak periods.[35] PierPASS was recently introduced to increase the hours of operation at the port. PierPASS offers an incentive to users to pick up and deliver shipments to/from the port from 6:00 pm until 3:00 am Monday through Friday and from 8:00 am to 6:00 pm on Saturdays. Ports are one of the last remaining businesses in the logistics family which do not operate on a 24/7 work schedule. Trucking, air and rail providers all operate on a 24/7 basis. Warehouses that support these logistics services are also opened 24/7 or at least allow shipments to be dropped and pulled from staging facilities. However, the program is unpopular among some drivers. Based on a survey of truck driver attitudes toward PierPASS, many reported that shorter waiting times in the port had not materialized.[36] In addition, they used their allowable driving hours waiting in long lines at night, and reportedly had less work during the day because the same volumes were spread out over a longer work day. A system-wide approach would more effectively address these and many other concerns.

Policies targeted at goods movement work can be effective, but in order to be optimal, a truly system-wide approach is needed. The performance measures should focus on a wide range of measures including the environment, rates of return on investment, capacity, and congestion.

4.14 A DISPARATE GOODS MOVEMENT SYSTEM AND COMMUNITY

The disparate nature in which the goods movement system is organized is a core issue for the study area, and is applicable both on the private side and on the public side. Because the entities involved in goods movement (from the shippers, manufacturers, receivers, private carriers, intermodal operators, warehouse and logistics operators, and port owners and operators to the public entities and transportation agencies) are organized disparately, it is increasingly difficult to address the issues in a coordinated and strategic manner.

The private sector is nimble and reacts quickly to performance measures and productivity improvements. Time is money in the private sector. Planning horizons are typically based on 1-3 and 5-year planning cycles. All projects are evaluated based on return on investment or return on assets. This makes crafting public-private partnerships difficult to broker especially when public planning cycles are often in 10 and 20 year increments.

The Private Sector

Section 3.0 of this Tech Memo reveals that the private intermodal system in the study area is not organized in such a way as to systematically deal with issues across the entire goods movement system. While the private intermodal systems address operational and investment strategies within their respective spheres of influence, they do not have the means or the information to develop system-wide solutions. The challenge is the development of an institutional approach that can garner the collective support of the private sector, the carriers, and the shippers to tackle specific solutions that have broad and system-wide implications. An example is the Gateway City Council of Governments Clean Air Program. The pilot program provides incentive grants to private trucking businesses to eliminate older, more polluting trucks from the roadways and replace them with cleaner trucks. The lesson from the program is that the fragmented structure of the local drayage industry, dominated by small owner-operators, presents an economic, operational, and ownership challenge toward expanding the engine replacement program beyond a pilot phase.

The Public Sector

An example of this issue on the public side surrounds the organization of the ports. The MCGMAP study area's mobility is critically affected by the geographical and institutional structure of the port complex. In addition to the independent ports, operated as departments of separate municipalities, the overall volume of container trade growth is handled by 14 independent privately operated terminals under lease agreement with one or the other of the ports.

Another example of this issue on the public side is the complexity of this specific effort, namely the MCGMAP effort. It is a joint effort including local county transportation commissions, an MPO, and the state's Department of Transportation, as well as a large and complex group of stakeholders. The actual implementation of projects stemming from this effort must be managed in a coordinated fashion, and will likely require some form of institutional approach. This will be further evaluated throughout the course of this effort.

Communities and Politics

The views and perspectives on goods movement vary widely among the communities in the study area. Communities most directly impacted by goods movement, specifically those at and around the ports and intermodal facilities, generally have a more cautious view of goods movement. Communities more removed from the direct impacts of high goods movement volumes are generally more aggressive about attracting goods movement-intensive land uses, with the prospect of generating tax revenues and providing jobs. Hence the political stance toward goods movement varies across communities, which presents a challenge in terms of developing a unified set of goods movement policies and strategies.

4.15 ADDITIONAL ISSUES AND CONSTRAINTS

In addition to the issues facing the various modes of the goods movement system, there are other issues and constraints related to the environment and economy of the study area. Air quality was discussed earlier in this Technical Memorandum, and a comprehensive discussion of environmental and economic issues is presented as a part of Task 5 - Evaluate the Community, Environmental, and Economic Impacts of Freight Movement Generators and Facilities.

Environmental Issues and Constraints

Water Quality Impacts

Water quality impacts associated with goods movement logically occur at the ports and along the ocean shipping lanes. In addition to pollution from vessels and harbor craft, vessel ballast water can bring exotic species into federal and state waters. There are also regional water quality impacts arising from increased truck traffic over the freeway and street network. Such non-point pollution sources help degrade overall water quality and are difficult to treat.

Land Use Conflicts, Noise, and Other Community Impacts

In understanding the environmental impacts of goods movement to the region, the effects on neighborhoods must be considered. As noted elsewhere, incompatible land uses have arisen over time where residential neighborhoods adjoin or are passed through by goods movement activities. The effects generated by goods movement can be readily obvious, such as traffic, air, or noise impacts, or can be more subtle and not as obvious to non-residents. The more subtle and not so obvious effects include:

- streets affected by trucks parked for long periods and late night activities
- prolonged idling for trains
- switching equipment or trucks
- views blocked by stacks of containers

Concerns about environmental and health impacts are also likely to be higher in communities where houses, schools, or parks are located near goods movement facilities. This concern has been increasingly expressed by low income and minority communities, under the term “environmental justice.” It should be noted that environmental justice is a complex issue and that the terminology can be misused. The federal Executive Order on this matter addresses disproportionately high and adverse impacts to minority or low-income neighborhoods and communities. An analysis of whether an environmental justice concern exists must evaluate whether an impact is disproportionately high in comparison to the other, non-classified neighborhoods in the region.

Noise pollution from goods movement is another issue, and although it can have physical effects on humans, it is primarily an annoyance affecting the quality of life. Noise impacts occur in association with loading and unloading activities, and along rail and truck routes that support the movement of trains or trucks. Congestion on freeways and the street network can compound noise impacts from trucks, from the sounds created by their braking and acceleration. To the extent that congestion on streets that serve warehouse operations increases over time, the potential for noise impacts also increases. Communities located near the air and water ports, rail yards, and other transfer points frequently complain about the annoyances associated with the operations of these facilities.

Another rail noise impact is from the sounding of at-grade crossing warning devices. Since safety regulations require that these devices be sounded as a train approaches and during the entire time that the train is passing through the crossing, the noise impact can occur for several minutes at a time. Concurrently, while traffic awaits a train's passage, idling trucks can create annoying noise and also increase air pollution in the area.

Other impacts that affect the communities include traffic congestion and bright or spillover lighting where transfer facilities are located near residential areas. Over time, the lengthening durations of nighttime work has increased, increasing annoyance and concern among residents of affected communities.

Scattered Land Use Impacts

Initially, goods movement-intensive land uses clustered tightly around rail corridors, ports, and freight corridors. As the overall volume of goods movement increased, the locations of transfer facilities spread inland, facilitated by rail and freeway networks. The development of this region-wide system led to a widespread distribution of environmental impacts. Locations that in the past were not affected by the impacts associated with goods movement have become affected. The new areas of impact have moved eastward over the past decade or so, reflecting the growth of distribution centers in the Inland Empire. This shift was driven by the need for large tracts of affordable land on which to build distribution centers that were accessible via the region's rail and freeway networks. The freeway network defines to a large degree where environmental impacts occur in the region, given that impacts are closely linked to where traffic congestion occurs, and the fact that the types of land uses most related to goods movements are served by freeways and major arterials.

The spread of goods movement facilities across the region has also resulted in the spreading of incompatible land uses to other areas, away from the traditional locations mentioned earlier. For instance, some residential areas in the Inland Empire that were once adjoined by agricultural lands are now adjoined by large warehousing complexes. Where the past adjacency relationship was benign, the new uses typically produce traffic, air, noise, and light impacts that are less compatible, if not conflicting, with residential land uses. This can lead to communities being deemed undesirable living areas, contributing to blight.

Numerous aspects of the existing goods movement system within the MCGMAP study area contribute to adverse environmental impacts. These issues are discussed in greater detail as a part of Task 5 - Evaluate the Community, Environmental, and Economic Impacts of Freight Movement Generators and Facilities.

Economic Issues and Constraints

It is important to give early attention to the economic aspects of goods movement, in advance of a more detailed analysis in Task 5. It is well understood that goods movement offers significant economic benefits to the study area. In 2003, over 38,700 firms employed 548,278 workers, 9.3 percent of the study area's employment. In addition, the logistics sector paid better than either the construction or the manufacturing sectors.[37] As discussed in the next section, the goods movement sector has an important strategic role in providing upward social mobility for the blue collar employment base. However, consistent year-to-year growth in the sector has resulted in a shortfall of labor presenting significant issues for industry.

Goods Movement and the Employment Base

The study area's per capita income slipped from a ranking of fourth among the 17 major U.S. consolidated metropolitan statistical areas in 1987 to sixteenth in 2001.[38] The logistics sector (sector involved in receiving, processing, storing, and moving goods) plays an important strategic role as a "skill ladder" for large numbers of blue collar workers that traditionally have only been found in manufacturing. In effect, the sector is backfilling the jobs left in the declining sectors.

The logistics sector is also a relatively capital- and information-intensive sector, which requires leading edge logistics, warehousing, and retailing companies to provide just-in-time services. Much of the information management approaches are computerized and networked into "neuro-logistics" (responsive and leaner) supply and distribution networks. As a result, relatively strong pay scales are possible in the logistics sector.

Shortage of Labor

The growth in the trade and logistics sectors in the study area can be equated to so-called "boom years"-- economic terminology for times of excessive demand that can lead to shortages in resources and upward pressure on prices and labor costs. Based on early research, this is occurring in the study area.

Table 30 is a projection of occupational employment needs for certain logistics sectors from 2004 through 2006. It is indicative of the shortage in resources. The table shows that on-the-job training (OJT) rather than classroom training is provided for each occupational level.

Table 30
Occupations with the Most Job Openings
Occupational Employment Projections 2004-2006 (California)

Occupational Title	Job Openings	Education & Training Levels
Laborers and Freight, Stock, and Material Movers, Hand	28,600	30-DAY OJT
Truck Drivers, Heavy and Tractor-Trailer	10,400	1-12 MO OJT
Packers and Packagers, Hand	8,000	30-DAY OJT
Truck Drivers, Light or Delivery Services	6,000	30-DAY OJT

Source: www.labormarketinfo.edd.ca.gov

Trucking is one of the hardest-hit sectors in terms of a shortage of drivers, a nationwide phenomenon. According to the Pacer Cartage office in Los Angeles (a trucking company that is typical in the port area), demand for truck drivers is so high that lead time to fill truck driver positions ranges up to six months. They anticipate a 25 percent increase in demand for the next year. The shortfall in truck drivers impacts the industry in terms of higher costs, lower productivity, and underutilization of assets. This translates to underutilization of equipment. For example, a local carrier that operates 2,500 trucks would routinely have 80 trucks parked against the fence due to lack of qualified drivers.

Because of the tight labor market, companies begin to rely on technology to keep hiring numbers constant. International Transportation Services, a terminal operating company for the BNSF Railway that manages the gate and intermodal rail terminal activities, plans to keep anticipated employment flat, thanks in part to technology. Also, the facility is at or near capacity and there is little room for volume growth.

One of the reasons that employment supply falls short of demand for the sector is the reliance on technological advancements and a centralization of office functions. Offices have global visibility of shipments yet have local control over dispatching functions. It is typical that when one service desk on the East Coast concludes operations for the day, customer service calls are routed to a Midwest or West Coast service desk to assist customers with dispute resolution. Because the market is very competitive, staff and overhead must be diligently managed. Managers are often asked to do more with less, and this trend will continue into the future.

Assembly Bill (AB) 2650 - A law passed in the state of California that fines terminal operators if trucks idle outside the terminal gate for more than 30 minutes.

Air Cargo - Freight that is moved by air transportation.

Air Carrier - An enterprise offering transportation service via air.

All-Cargo Carrier - An air carrier transporting cargo only.

Arterial - A moderate- or high-capacity highway that is just below an expressway classification. Much like a biological artery, an arterial road carries large volumes of traffic between areas in urban centers. Arterials serve as links between local streets and expressways and freeways with interchanges.

Average Annual Daily Traffic (AADT) - A useful and simple measurement of how busy a road is determined by averaging the daily flow of traffic over a year. Consists of a seven-day average of traffic on a roadway facility.

Balance of Trade - The surplus or deficit that results from comparing a country's exports and imports of merchandise only.

Belly Cargo - Cargo carried in the belly deck below the passenger deck of a passenger aircraft.

Bobtail - A truck with shorter bed. Otherwise known as a Straight Truck, Box Truck, or Box Van.

Boxcar - An enclosed railcar, typically 40 to 50 feet long, used for packaged freight and some bulk commodities.

Break-Bulk - The separation of a consolidated bulk load into smaller individual shipments for delivery to the ultimate consignee. The freight may be moved intact inside the trailer, or it may be interchanged and rehandled to connecting carriers.

Break-Bulk Cargo - Cargo shipped as a unit or package (for example: palletized cargo, boxed cargo, large machinery, trucks) but is not containerized.

Break-Bulk Vessel - A vessel designed to handle break-bulk cargo.

Bulk Area - A storage area for large items that, at a minimum, are most efficiently handled by the palletload.

Bulk Cargo - Goods not in packages or containers. See also, Break-Bulk Cargo.

Bulk Transfer Facilities - Facilities used primarily for the storage and/or marketing of petroleum products, and/or facilities that receive petroleum products by tanker, barge, or pipeline.

Cabotage - The carriage of cargo that originates and terminates within the boundaries of a given country by a carrier of another country.

Cargo - Merchandise carried by a means of transportation.

Cargo-Only Airport - An airport that has one or more air cargo operators and no passenger operations.

Carload - In the rail industry parlance, carload traffic refers to cargo moved in or on boxcars, gondolas, tank cars, flatcars, and other conventional railroad vehicles. Typical carload commodities include lumber, paper, scrap metal, coal, aggregates, chemicals, steel, machinery, and large appliances, among many other things. Trains carrying this traffic are sometimes called carload or merchandise trains.

Carrier - An enterprise engaged in the business of transporting goods.

Classification Yard - A railroad terminal area where railcars are grouped together in blocks to form train units. These blocks are combined into long distance trains that drop off the blocks at various destinations along their routes.

Coastal Carriers - Water carriers providing service along coasts serving ports on the Atlantic or Pacific Oceans or on the Gulf of Mexico.

Combi Aircraft - A passenger/cargo aircraft specially designed to carry unitized cargo loads on the upper deck of the craft, forward of the passenger area.

Container - A single rigid receptacle without wheels that is used for the transport of goods (a type of carrier equipment into which freight is loaded).

Container Chassis - A vehicle built for the purpose of transporting a container so that, when a container and chassis are assembled, the produced unit serves as a road trailer.

Container Depot - The storage area for empty containers.

Container Terminal - An area designated for the stowage of cargo in containers that may be accessed by truck, rail, or ocean transportation.

Container Vessel - A vessel specifically designed for the carriage of containers.

Container Yard - The location designated by the carrier for receiving, assembling, holding, storing, and delivering containers, and where containers may be picked up by shippers or redelivered by consignees.

Containerization - The technique of using a boxlike device in which a number of packages are stored, protected, and handled as a single unit in transit.

Cross Dock - An enterprise that provides services to transfer goods from one piece of transportation equipment to another. Commonly used to transfer shipments between local delivery trucks and long-haul (intercity) trucks.

Cross-Docking - The movement of goods directly from receiving dock to shipping dock to eliminate storage expense. Many times a site is chosen to consolidate goods from several origins and reship to the retail or manufacturing site (sometimes called Merge in Transit or Flow Through Distribution).

Cube Out - The situation when a piece of equipment has reached its volumetric capacity before reaching the permitted weight limit.

Customization Centers - Locations where goods are prepared as floor-ready merchandise based on the latest point of sale data.

Distribution Center (DC) - A finished goods warehouse from which a company assembles customer orders.

Dock - A space used for receiving merchandise at a freight terminal.

Enterprise Resource Planning (ERP) - A cross-functional/regional planning process supporting regional forecasting, distribution planning, operations centers planning, and other planning activities. The process provides the means to plan, analyze, and monitor the flow of demand/supply alignment and to allocate critical resources to support the business plan.

Export - To send goods and services to another country.

Federal Aviation Administration - The federal agency that administers federal safety regulations governing air transportation.

First Tier (or Top Tier) – A term used to point out the leading industry group in a specific sector. This is not typically an official term, but a term used herein to classify the leading entities.

Foreign Trade Zone (FTZ) - A site sanctioned by the U.S. Customs Service in which imported goods are exempted from duties until withdrawn for domestic sale or use. Such zones are used by commercial warehouses or assembly plants.

Freight Forwarder - An enterprise providing services to facilitate the transport of shipments. Services can include documentation preparation, space and equipment reservation, warehousing, consolidation, delivery, clearance, banking and insurance services, and agency services. The forwarder may facilitate transport by land, air, or ocean, or may specialize in one mode of transport. Also called Forwarder or Foreign Freight Forwarder.

Freight Analysis Framework (FAF) - The Freight Analysis Framework, created by the Federal Highway Administration, integrates data from a variety of sources to estimate commodity flows and related freight transportation activity among states, regions, and major international gateways.

Freight Gateways - A term generally used to refer to major freight airports, seaports, or intermodal facilities.

Full Container Load (FCL) - A term used when goods occupy a whole container.

Full Equivalent Unit (FEU) - A unit of measure to account for a full-sized (40-foot long) international container. One FEU equates to two 20-foot Equivalent Units (TEUs).

Full Truck Load (FTL) - Same as Full Container Load, but in reference to motor carriage instead of containers.

Goods - A term associated with more than one definition: 1) common term indicating movable property, merchandise or wares, 2) all materials used to satisfy demands, 3) whole or part of the cargo received from the shipper, including any equipment supplied by the shipper.

Hopper Cars - Railcars that permit top loading and bottom unloading of bulk commodities; some hopper cars have permanent tops with hatches to provide protection against the elements.

Hostling Trucks – A motorized vehicle (small truck) used for moving trailers/chassis around a port terminal or intermodal yard, specifically to transfer cargo containers and equipment from one mode to another.

Hub - A central location to which traffic from many cities is directed and from which traffic is fed to other areas.

Hub Airport - An airport that serves as the focal point for the origin and termination of long-distance flights; flights from outlying areas meet connecting flights at the hub airport.

Integrated Freight Carriers - Typically refers to air cargo and express carriers that provide door-to-door service via any combination of modes. They control the reliability of service by owning the ground transport operations as well as the air lift capacity, exercising control through ownership (for example, FedEx and UPS). They also use information technology to exercise control.

Integrated Logistics - An integrating process that combines the classic logistics functions of physical distribution and materials management with the purchasing of raw materials and/or inventory and sales, marketing, information technology, and strategic planning functions.

Intermodal - See Intermodal Transportation.

Intermodal Facility - Facilities that allow for the transfer of uniform containers from one mode to another. The term is most commonly associated with a facility that allows for the transfer of containers between rail and truck. It is also used more widely to apply to cargo transfer between ships, barges, railcars, and trailer chassis.

Intermodal Transportation - The use of two or more transportation modes to transport freight; for example, rail to ship to truck, most commonly used or applied in industry to describe shipment of containers by rail.

Inventory Carrying Cost - A measure to account for the cost of goods in delay. This measure is not commonly used in the public transportation sector.

Just In Case (JIC) - An inventory strategy companies use whereby large inventories are kept on hand.

Just In Time (JIT) - An inventory strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs. This method requires that producers are able to accurately forecast demand.

Less than Container Load (LCL) - A term used when goods do not completely occupy an entire container. When many shippers' goods occupy a single container, each shipper's shipment is considered to be LCL.

Less-Than-Truckload (LTL) - A segment of the trucking industry catering to shippers with loads that are less than a full truck load. Shipments that are smaller than a full truckload are combined with other LTL shipments, thereby allowing the LTL trucker to benefit from the economies of scale enjoyed by full truckload truckers.

Level of Service (LOS) - A standard measurement used by transportation officials that reflects the relative ease of traffic flow on a scale of A to F, with free-flow conditions being rated LOS A and completely congested conditions rated as LOS F.

Lift Capacity - Term used to describe a particular carrier or terminal operator's capacity to handle cargo. Most often (not exclusively) applied to intermodal yards and air cargo carriers.

Line-Haul - The long-haul portion of an intermodal trip, typically the main rail trip between the originating and terminating intermodal yards. On either end of the line-haul is the local dray to and from the intermodal yard.

Local Dray - A local truck trip to and from an intermodal yard or port or warehouse.

Logistics - The process of planning, implementing, and controlling procedures for the efficient and effective storage of goods, services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements.

Mega Terminals - In the context of the marine and ports industry, a large terminal built to accommodate the new generation of mega ships (sometimes referred to as post-Panamax). In cases where a new terminal cannot be built, one or more of the existing terminals are tied together to provide the needed acreage and facilities.

Metric Revenue Tons (MRT) - Traditionally, cargo volumes through ports were reported in terms of tons (or metric tons). However, for ports that have a high component of containerized traffic, this measure underestimates the volume from a value or revenue standpoint, and hence the measure of metric revenue tons is used. Containerized cargo tends to have a higher value (revenue) to weight ratio than most non-containerized cargo. While non-containerized cargo has a one-to-one relationship between metric tons (MT) and metric revenue tons, the relationship for containerized cargo is typically greater than one and varies depending on the mix of cargo.

Metropolitan Planning Organization (MPO) - A regional transportation planning body required to approve transportation improvement plans, to ensure that they are consistent with federal legislation and that they are fiscally sound. It aims to achieve local consensus between different levels of government and across jurisdictions.

Mode of Transportation - The specific type of technology or vehicle involved in the movement of goods and passengers; for example, a railroad, an automobile, an airplane, or a ship.

Movement of Goods - The transfer of goods from one location to another.

Net Rentable Area - The actual square footage of a building that can be rented.

Net Weight - The weight of the merchandise, unpacked, exclusive of any containers.

Non-Integrated Freight Carriers - These types of freight carriers serve two functions: (1) provide scheduled service on major traffic lanes, and (2) provide outsourcing, carrying contracted freight for freight forwarders and other airlines. They typically involve a single mode of transport.

Non-Vessel Operating Common Carrier (NVOCC) - A firm that offers the same services as an ocean carrier, but does not own or operate a vessel. NVOCCs usually act as consolidators, accepting small shipments (LCL) and consolidating them into full container loads. They also consolidate and disperse international containers that originate at, or are bound for, inland ports. They then act as a shipper, tendering the containers to ocean common carriers. They are required to file tariffs with the Federal Maritime Commission and are subject to the same laws and statutes that apply to primary common carriers.

North American Free Trade Agreement (NAFTA) - A free trade agreement, implemented January 1, 1994, between Canada, the United States, and Mexico.

On-Dock, Near-Dock, Off-Dock Intermodal Facilities - On-dock intermodal facilities are located in or immediately adjacent to marine terminals. Near-dock intermodal facilities are located within a few miles from port areas. Off-dock intermodal facilities are comparatively distant from port areas.

Person Hours - A measure to account for the number of hours spent by the occupants of vehicles in traffic.

Port - A harbor where ships will anchor.

Ports of Call - Ports at which a vessel, or string of vessels, stop so as to unload and load cargo.

Port of Entry - A port at which foreign goods are admitted into the receiving country.

Post-Panamax Vessel - A container ship too large to pass through the Panama Canal, typically with a capacity in excess of 6,000 TEUs.

Project Cargo - Typically associated with large machinery and equipment used in the construction of major infrastructure projects such as power plants or industrial plants. Large or voluminous shipments, or shipments composed of complex components that must be disassembled, shipped, and then re-assembled.

Private Carrier - A carrier that provides transportation service to the firm that owns or leases the vehicles and does not charge a fee. Private motor carriers may haul at a fee for wholly-owned subsidiaries.

Regional Transportation Plan - A long-term multimodal transportation plan prepared by a Metropolitan Planning Organization (MPO), typically with a 20-year outlook.

Rolling Stock - Traditionally means "vehicles." The term is used in logistics to refer to inventory in motion, or inventory in the pipeline, not at rest.

Roll On/Roll Off (RO/RO) - A term most commonly used to describe ships designed for the carriage of wheeled cargo. These ships typically have large doors in the hull and external ramps that fold down to allow rolling of wheeled cargo between the ship and the pier. The term is also applied to the wheeled cargo itself (RO/RO cargo).

Scheduled Service - A type of service offered by carriers for a designated route that includes multiple designated stopping points, with scheduled times of arrival and departure. The carrier aims to stay within the schedule so as to provide a reliable service that customers can depend on, and can sequence their shipments accordingly.

Second Tier - A term used to point out the second most significant group of players in a specific sector (see First Tier).

Shipping Line - Businesses that own and/or operate the ocean vessels carrying ocean-borne cargo between international ports (also referred to as steamship lines).

Short Line - A local rail line that covers a short distance, not part of a rail network. Ports use a short line to move goods between customers, storage areas, and staging areas within the port without interfering with main line operations.

Spur Track - A railroad track connecting a company's plant or warehouse with the railroad's track; the user bears the cost of the spur track and its maintenance.

Steamship Line - A company that owns and/or operates vessels in maritime trade.

Supply Chain(s) - A group of physical entities such as manufacturing plants, distribution centers, conveyances, retail outlets, people, and information that are linked together through processes (such as procurement or logistics) in an integrated fashion, to supply goods or services from source through consumption.

Supply Chain Management (SCM) - The integration of the supplier, distributor, and customer logistics requirements into one cohesive process to include demand planning, forecasting, materials requisition, order processing, inventory allocation, order fulfillment, transportation services, receiving, invoicing, and payment.

Terminal Operator - The enterprise responsible for the operation of facilities for one or more modes of transportation.

Third Party Logistics Provider (3PL) - A third party that handles many of the supply chain logistics aspects on behalf of a large shipper/receiver. Makes many of the decisions related to the shipment of goods mode choice, routing, transit times, pricing, staging locations, etc.

Transloading - The practice of transferring goods from marine containers to domestic intermodal containers or trucks at a distribution center or warehouse.

Transportation Corridor - A single route or combination of routes along the same general path, between at least two points (one on either end). In general, a transportation corridor is not just one road or rail line, but a combination of modes.

Transshipment - The shipment of merchandise to the point of destination in another country on more than one vessel or vehicle.

Truck Climbing Lanes - Highway lanes in which trucks must operate where the incline of the road becomes steep to the point of reducing truck speeds. They are designed to permit slower-moving trucks to operate at their own pace without reducing the speed of the mixed-flow traffic operating in the lanes without trucks. Typically located on the outside lanes of a highway in an uphill direction.

Truckload (TL) - Quantity of freight required to fill a truck, or at a minimum, the amount required to qualify for a truckload rate.

Truck Turn Time - The time it takes from when a truck arrives at a port (or intermodal yard), loads/unloads its cargo, and departs.

Twenty-foot Equivalent Unit (TEU) - A measure of containerized cargo equal to one standard 20-foot by eight foot by 8½ foot container. A full size 40-foot container (FEU) is counted as two TEUs.

Vessel String - Term used in the ocean shipping business to refer to a group of vessels that serve a specific route. In order to meet a scheduled service, the vessels are sequenced into a string so as to serve the route and meet predetermined dates and times of arrival and departure.

Warehouse - Storage place for products that are in transit. Principal warehouse activities include receipt of product, storage, shipment, and order picking.

AADT	Annual Average Daily Traffic
ACE	Alameda Corridor East
ACTA	Alameda Corridor Transportation Authority
AF	United States Air Force
ARZC	Arizona and California Railroad
BNSF	Burlington Northern and Santa Fe Railway
BUR	Burbank Airport
Caltrans	California State Department of Transportation
CARB	California Air Resources Board
CBRE	C.B. Richard Ellis
CEQA	California Environmental Quality Act
CofI	City of Industry
CTA	Central Terminal Area at LAX
CY	Calendar Year
CZRY	Carrizo Gorge Railway – the Desert Line
EIR	Environmental Impact Report
ELA	East Los Angeles
EPA	Environmental Protection Agency
ERP	Enterprise Resource Planning
FAF	Freight Analysis Framework
FedEx	Federal Express
FERC	Federal Energy Regulatory Commission
FEU	Full Equivalent Unit
FHWA	Federal Highway Administration
FPN	Ferrocarriles Peninsulares del Noroeste
FTZ	Foreign Trade Zone
FY	Fiscal Year
GIS	Geographic Information Systems
GPS	Global Positioning System
HHDT	Heavy Heavy Duty Truck Classification
HOV	High Occupancy Vehicle
ICTF	Intermodal Container Transfer Facility
ILWU	International Longshoreman and Warehouse Union
ITS	Intelligent Transportation Systems
JIC	Just in Case
JIT	Just in Time

LACSD	County Sanitation Districts of Los Angeles County
LAJ	Los Angeles Junction Railway
LATC	Los Angeles Transportation Center
LAWA	Los Angeles World Airports
LAX	Los Angeles International Airport
LCL	Less-Than-Container-Loads
LGB	Long Beach Airport
LHDT	Light Heavy Duty Truck Classification
LNG	Liquefied Natural Gas
LOS	Level of Service
LOSSAN	Los Angeles to San Diego Rail Corridor
LRTP	Long Range Transportation Plan
LTL	Less Than Truckload
MAT	Millions Annual Tons
MCGMAP	Multi-County Goods Movement Action Plan
Metro	Los Angeles County Metropolitan Transportation Authority
MHDT	Medium Heavy Duty Truck Classification
MPO	Metropolitan Planning Organization
MRL	Mesquite Regional Landfill
MRT	Metric Revenue Tons
MSF	Million Square Feet
MT	Metric Tons
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NAIOP	National Association of Industrial and Office Properties
NISC	National Infrastructure Security Committee
NOP	Notice of Preparation
NRA	Net Rentable Area
NRDC	Natural Resources Defense Council
NVOCC	Non-Vessel Owning Common Carriers
OCTA	Orange County Transportation Authority
OJT	On-the-job training
ONT	Ontario International Airport
PCH	Pacific Coast Highway
PDS	Position Detection System
PHL	Pacific Harbor Line
POLA	Port of Los Angeles
POLB	Port of Long Beach
PMD	Palmdale Regional Airport
PNW	Pacific Northwest

RCTC	Riverside County Transportation Commission
RFID	Radio Frequency Identification
RO/RO	Roll On/Roll Off
RTP	Regional Transportation Plan
RTW	Round-the-World
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act - A Legacy for Users
SANBAG	San Bernardino Associated Governments
SBD	San Bernardino International Airport
SCAG	Southern California Association of Governments
SCIG	Southern California International Gateway
SCM	Supply Chain Management
SCRRA	Southern California Regional Rail Authority
SDIY	San Diego and Imperial Valley Railroad
SF	Square Feet
SNA	John Wayne/Santa Ana Airport
SPB	San Pedro Bay
3PL	Third Party Logistics
TEU	Twenty-Foot Equivalent Units
TOS	Terminal Operating System
UP	Union Pacific Railroad
UPS	United Parcel Service
USPS	US Postal Services
VCRR	Ventura County Railroad
VCTC	Ventura County Transportation Commission
VMT	Vehicle Miles Traveled
VNY	Van Nuys Airport
YTD	Year to date

Section E.0 – Executive Summary

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Section 2.0 – Existing Conditions

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13. AB 2650 is a law in the State of California that mandates a fine on terminal operators if trucks idle outside the gate for a period longer than 30 minutes.
14. Subtracting the 35 minutes to load/unload from the 2.6 hours average port-related waiting time means that trucks actually idle for around two hours on average. According to the previously cited METRANS research, "the fact that terminals are not fined if they maintained appointment systems or extended gate hours, as well as the lack of manpower to monitor truck idling, has led to criticism that the law has had little effect on the amount of time trucks spend waiting at the ports."
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16. Based on average total trip time of 4.6 hours, less the 2.6 hours at the port, which includes the 35 minutes to load/unload.
17. Based on the amount of free time allowed for containers at a rail intermodal yard before a charge is levied.
18. Schedule customer deliveries to within 24 hours of outbound train.
19. Industry interviews indicate a two to three day dwell time for containers can occur when there is a derailment or severe weather along the system; CEA Consulting, 2006.
20. Interviews with local trucking company executives; October and November 2005.
21. Ibid.
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24. Refers to the number of times inventory is turned over/replaced. These averages can vary based on industry and commodity.
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26. Warehouse shipments are unitized/palletized to make them easier and faster to handle, receive, and process at the retail stores. In most cases the shipments are staged on the loading docks prior to the driver's arrival to increase truck turn time.
27. Deliveries are scheduled within a certain window, therefore making queuing uncommon, except in the fourth quarter when volumes tend to be higher due to demand related to the holiday season.

28. Interviews with local trucking company executives; October and November 2005.

Section 4.0 – Constraints, Issues, and Problems

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